BELL TELEPHONE QUARTERLY

SINGLE COPY ~ 50¢ ~

PER YEAR ~ $1.50 ~

JULY, 1930

TABLE OF CONTENTS

Change from Manual to Dial Operation
K. W. Waterson

World-Wide Telephony
Elam Miller

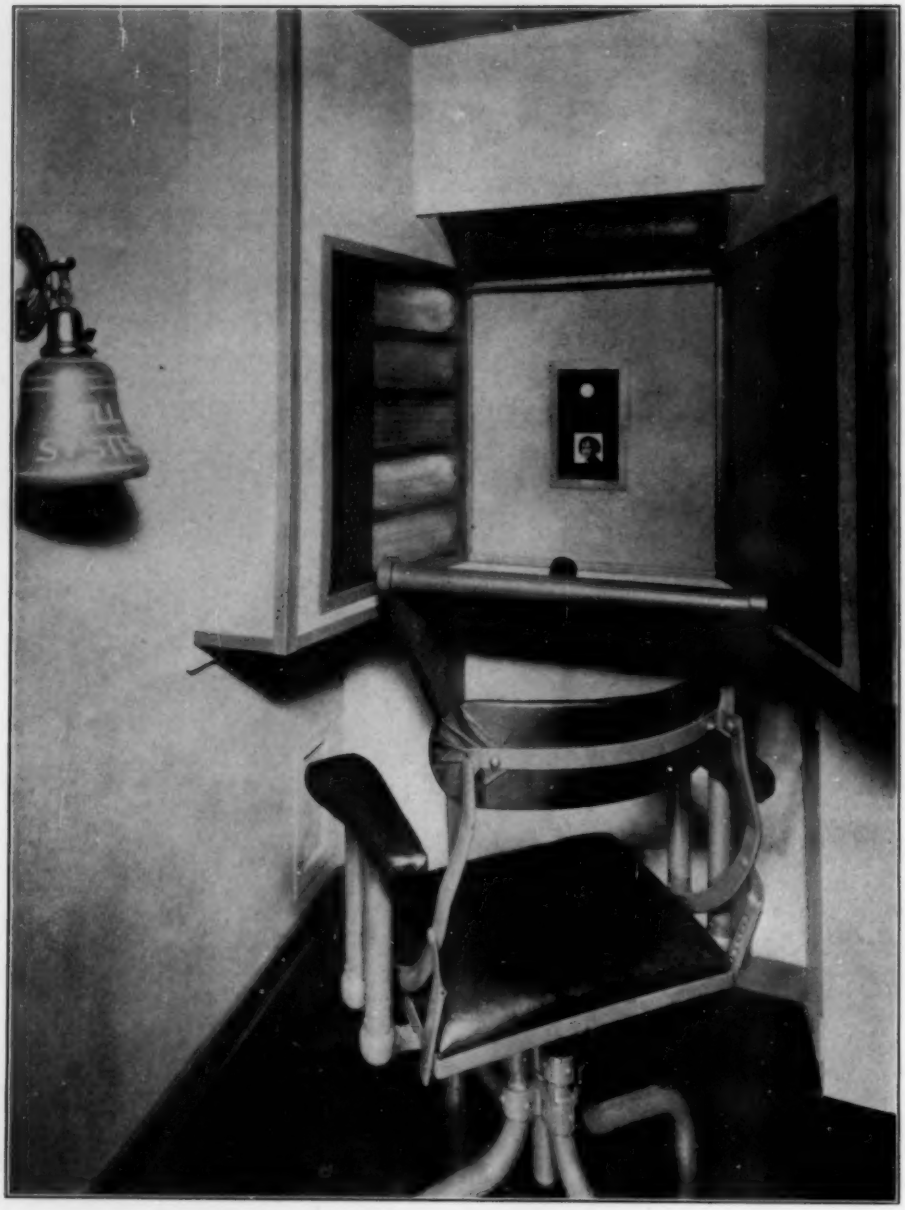
Trade Mark Service in Classified Telephone Directories Contributes to Modern Merchandising
H. W. MacNair

The First Telephone Switchboard and Its Method of Operation
G. K. Thompson and R. B. Hill

World's Telephone Statistics, January 1, 1929
C. J. Koukol

Notes on Recent Occurrences

AMERICAN TELEPHONE & TELEGRAPH CO.
NEW YORK



Booth Used in Demonstration of Two-way Television.

(See Notes on Recent Occurrences.)

BELL TELEPHONE QUARTERLY

A Medium of Suggestion and a Record of Progress

CONTENTS FOR JULY 1930

PAGE

Change from Manual to Dial Operation—*K. W. Waterson* 163

World-Wide Telephony—*Elam Miller* 169

Trade Mark Service in Classified Telephone Directories Contributes to Modern Merchandising—*H. W. MacNair* 198

The First Telephone Switchboard and Its Method of Operation—*G. K. Thompson and R. B. Hill* 205

World's Telephone Statistics, January 1, 1929—*C. J. Koukol* 212

Notes on Recent Occurrences 224

VOL. IX NO. 3

PUBLISHED QUARTERLY FOR THE BELL SYSTEM BY THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY. SUBSCRIPTION, $1.50 PER YEAR, IN UNITED STATES AND CANADA; SINGLE COPIES, 50 CENTS

Address all communications to

INFORMATION DEPARTMENT
AMERICAN TELEPHONE AND TELEGRAPH COMPANY
195 Broadway, New York

CONTRIBUTORS TO THIS ISSUE

KARL W. WATERSON

Massachusetts Institute of Technology, B.S., 1898; joined engineering staff of the American Telephone and Telegraph Company (then American Bell Telephone Company) on graduation; for many years in charge of traffic section with title of Engineer of Traffic and later Assistant Chief Engineer. Now Assistant Vice President, in charge of Traffic, Plant Operation and General Operating Results.

ELAM MILLER

Began engineering work for The Pacific Telephone and Telegraph Company in 1902 and continued in various plant engineering capacities until 1911 when he was made General Commercial Engineer. In 1912 transferred to the American Telephone and Telegraph Company, since which time he has been engaged in various engineering capacities on the general staff.

HUGH W. MAC NAIR

Brown University, Ph.B., 1917. After four years editorial and advertising experience in New York City joined Directory Group of the Commercial Engineer's staff, American Telephone and Telegraph Company, May 1924. General Commercial Supervisor's Staff, New York Telephone Company, Manhattan Area, July 1, 1930.

GEORGE K. THOMPSON

Entering the Bell System in 1882, Mr. Thompson was in charge of the section of the American Telephone and Telegraph Company's Engineering Department devoted to the development of instruments and substation equipment, and from 1919 to 1926 was in charge of a similar section in the Company's Department of Development and Research, retiring in May 1930 after 48 years of continuous service.

ROGER B. HILL

Harvard College, B.S., 1911. Engineering Department, American Telephone and Telegraph Company, 1911–1919. Department of Development and Research, 1919–1930. Since 1922 in charge of work on Development Economics, Outside Plant Division.

CLEMENT J. KOUKOL

Columbia University, E. E., 1914. Engineering work in the Department of Development and Research, American Telephone and Telegraph Company, 1914–1921. Chief Statistician's Division, 1921–.

Change from Manual to Dial Operation

IN December, 1921, the first dial office of the panel type designed particularly to meet the conditions of large cities was cut into service and after nine years a brief review of the use of dial telephones in the Bell System may be of interest.

For the first few years after 1921 dial service was introduced relatively slowly as it was desirable to observe its operation under all conditions and to make plans and preparations for manufacture and installation on a large scale. For the last few years the introduction has been rapid and 4,300,000 telephones have now been provided with dial service either of the panel or step type. This is 28 percent of the total stations and it is expected that the conversion to the new system in all places for which it is suitable will be completed within eight or ten years.

It has been the practice in the Bell System since its establishment more than 50 years ago to attempt to forecast the growth of the business and to design and to improve the systems, apparatus, materials and operating methods which will be necessary so that they will be available for service as required and not after the need has developed. Inasmuch as switchboards and switching systems control the service given and are the most complicated parts of the telephone plant they have naturally been the subject of particular consideration. While few people, if any, have foreseen fully the great development of the telephone, it became evident some fifteen years ago that the future public demand for service would be much greater than had been experienced up to that time, and that it would be more and more difficult and expensive to meet that demand and to continue to improve service with the manual system. In the last ten years the number of Bell telephones

has increased from 8,300,000 to 15,400,000 or 85 percent. The problems of giving telephone service when there are only a few telephones in a small town are relatively simple but the value of the service is correspondingly limited. With growth the service becomes more valuable to each subscriber and the problems of interconnection compound, the difficulties increasing more rapidly than the growth in stations. In the largest metropolitan area (New York City and suburbs) there are 2,400,000 telephones served from 235 central offices and the switching system required in order that anyone may be connected promptly with anyone else is necessarily complicated. Furthermore, no place can be considered in isolation and plans must be worked out for local, toll and long distance calls to permit a nation-wide service which today is being rapidly expanded into a world system.

Careful studies were made of all known switching systems. Improvements for existing systems were worked out and development work was done on all new switching arrangements that seemed promising. To meet the complicated requirements of the largest cities and areas many new and special arrangements had to be devised. All this work took time since trials of the various features under actual operating conditions were necessary in addition to the large amount of study and design. As a result of this comprehensive investigation it was evident that the dial system would give better and more uniform service than was possible with the manual system and at less cost, the improvement being more marked in the larger cities.

It was not enough to design a system which would operate satisfactorily when fully installed, but a complete interconnecting arrangement had to be worked out so that the manual and dial systems could operate together during the transition period and without burdening the subscribers with special procedures, thus making it possible to introduce the new system with no interference to the service and without causing serious

financial or employment problems. With hundreds of thousands and even millions of stations in a single metropolitan area it would be impracticable as well as prohibitive in cost to attempt a complete change from the manual to the dial basis at one time.

Experience has shown that the dial system has come fully up to expectations with regard to service. It is more accurate than manual service and when fully installed in a given place the dial service is quicker. During hours of light use such as nights, Sundays and holidays when manual boards have to be operated with a skeleton force, and therefore with a somewhat slower service, the dial service is just as rapid as during the busier hours of the day. While the dial service has to be completely installed in a given area to realize fully all of its service advantages, particularly those of speed, the methods of interconnection with existing manual offices have been so worked out that there is not only no deterioration in service during the transition period but improvement is continuous from the start of dial conversion. As was expected the dial system is also proving more adaptable to improvements and developments to keep pace with the rapidly increasing requirements of the telephone service.

There is convincing evidence that a very large proportion of the millions of present subscribers using the dial prefer that system to the manual and few express any decided preference in favor of the manual service. The dial has also realized predictions in that it has enabled improvements to be made in telephone service and the large growth to be handled at less cost than would have been possible with the manual system.

There is some impression that operators are not required with the dial system and that its use is reducing employment for women. This is probably due to the nature of the dial itself and to the original designation of the system as "automatic" although the manual system has a great deal of machinery and many automatic features. As a matter of fact a

great many operators are required with the dial system to handle toll and other special calls and to assist in its general operation. As will be seen from the following figures, furthermore, the introduction of the dial is not reducing employment but it simply avoids as rapid an increase in operators as would be needed with the manual system.

When the dial system was introduced in 1920 there were 128,000 operators in the Bell System. At the present time due to the growth of the business and the requirements for operators even with the dial, 160,000 are employed although the system is now 28 percent on a dial basis. By 1940 when it is expected that the conversion to the dial system will be completed, it is estimated that 180,000 operators will be required. These figures include only the women employed in the telephone company's operating rooms. In other branches of telephone work there has been a steady increase in the number of women employed from 35,000 in 1920 to 80,000 in 1930, and it is expected that the requirements in 1940 will be about 110,000. The total number of women employed in the Bell System, therefore, has increased from 163,000 in 1920 to 240,000 at the present time with an estimated requirement of about 290,000 in 1940. In addition there were some 70,000 private branch exchange positions located on subscribers' premises in 1920 and it is expected that there will be 175,000 in 1940. While the attendants at the smaller boards frequently do other work in addition to their telephone operating these figures represent fairly the proportionate increase in employment. In any consideration of the effect of the introduction of the dial system on employment the larger amount of apparatus involved is an important factor and the number of men employed in the manufacture, installation and maintenance of that equipment shows a large increase over what would have been needed with the manual system.

In many industries the introduction of machinery has meant a large reduction in the number of people employed. Despite

this it has been generally recognized that the welfare of mankind has been advanced through increased production by machine operations. Even if it were true that the dial system reduced the number of people employed, its use would probably be justified from the standpoint of improved service and the avoidance of cost increases. The telephone business is in a fortunate position from an employment viewpoint, however, and the plans have been so worked out that the change from manual to dial operation in the larger places does not result in even a temporary reduction in employment and the total number of people employed is increasing steadily in spite of the dial. There are cases in the medium sized and smaller cities where the conversion to dial is completed wholly or in large part at one time which will result in a temporary decrease in the number of operators required, but this will soon be made up by growth, and as already noted there is an increase in the number of men required when the dial system is introduced. Even in these cases, it is almost always possible through the employment of ex-operators and others desiring temporary work for a time before the cutover to avoid any reduction in the permanent force of operators.

There is another phase of the employment problem which is worth notice. In the last ten years the number of telephones has increased 85 percent while the population has increased only about 14 percent. With an increasing demand in many other industries also, for women of the type needed for telephone work, the telephone companies would have been confronted with a more and more difficult problem with the manual system to obtain the number of operators required.

The introduction of the dial system is in line with industrial and social progress. It is the general trend in both business and personal activities to expect faster methods of communication with less risk of error and the utilization of all practical mechanical devices for effecting improvements. It is the fundamental policy of the Bell System to give its customers the

best possible service at all times and at the lowest cost consistent with financial safety. Without dial operation it would have been increasingly difficult to meet the needs of subscribers and to insure continued improvements in service and there would have been substantial increases in cost for a service which would have fallen farther and farther behind the possibilities of the dial system.

K. W. WATERSON.

World-Wide Telephony

IT is the aim of the Bell System to increase the possibilities of telephone connection so that ultimately any Bell System subscriber can establish communication with a telephone in any part of the civilized world. To accomplish this, additional facilities are necessary both here and in other countries, as well as suitable operating arrangements. Recent technical advances in radio telephony, particularly in short wave radio, make available means for providing these additional facilities that have not previously existed. An outline of the picture of world telephony is presented herein as it exists today with some indication of what may be expected in the future. An accompanying map shows the existing and proposed radio telephone circuits of the world.

Bell System Activities

Other than the extension of service to Cuba in April, 1921, by submarine cable, the establishment of the transatlantic radio telephone link by the American Telephone and Telegraph Company and the British General Post Office in January, 1927, was the first step in extending Bell System service beyond the North American continent. It was also the first intercontinental telephone circuit and the first long distance radio telephone circuit used for message purposes. The growth of transatlantic service from one radio circuit in 1927 to four such circuits in 1929 and from a few messages per day in 1927 to an average of some 50 messages per day in 1929 shows the importance of this step.

Transatlantic radio telephony has been described in numerous other articles. It is sufficient to point out here that this means is used for connecting the Bell System with the European network, the Bell System being in turn connected

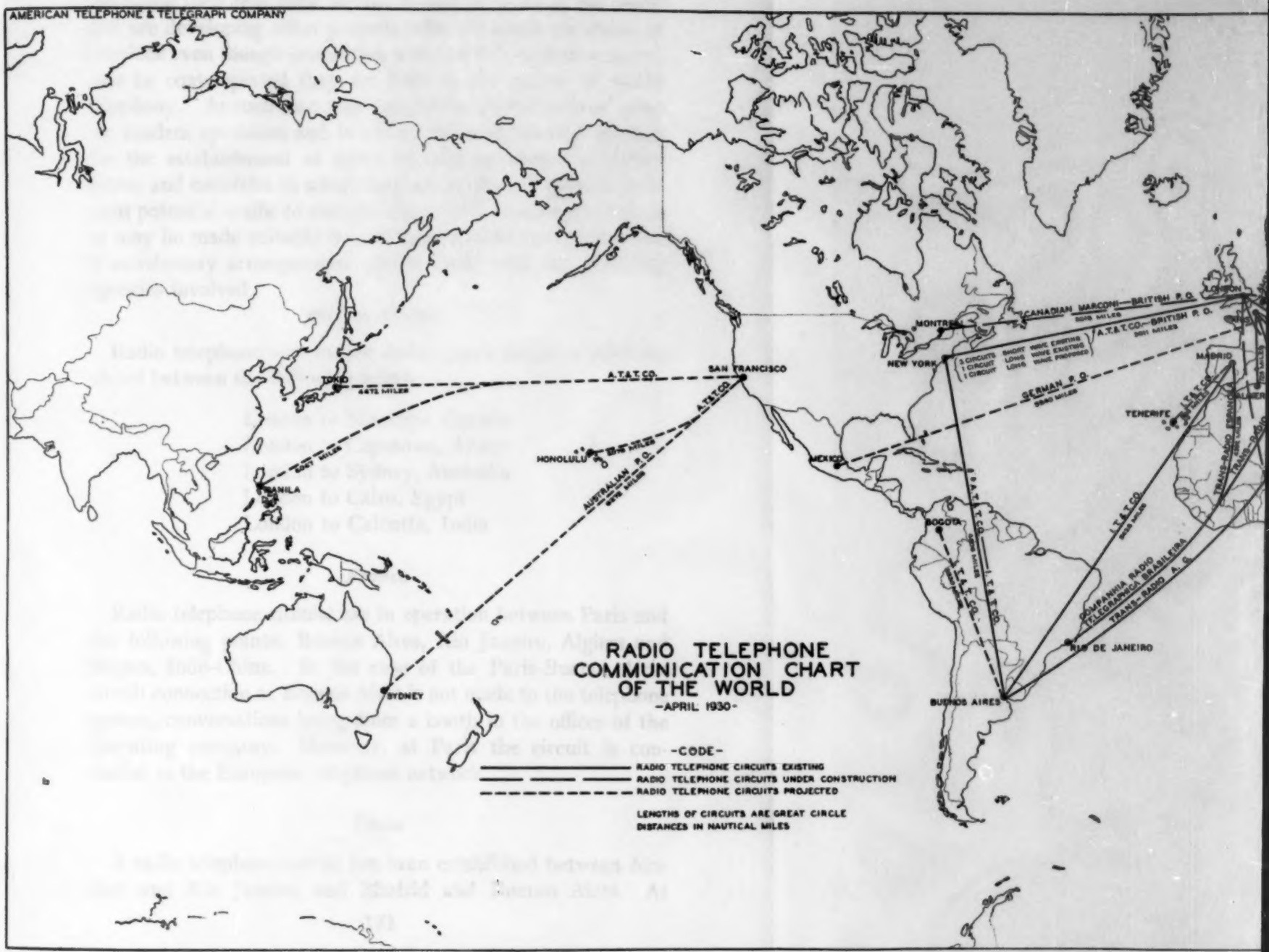
by wire with the telephone systems in Canada, Cuba and the principal cities of Mexico. There has recently been established a two-way short wave radio telephone circuit between New York and Buenos Aires which connects the Bell System with the telephone system of Argentina and through existing wire lines with the telephone systems of Chile and Uruguay. This means that the point has been reached where over 86 percent of the world's telephones are offered commercial interconnection in one network with a minimum of delay and with a generally satisfactory grade of service.

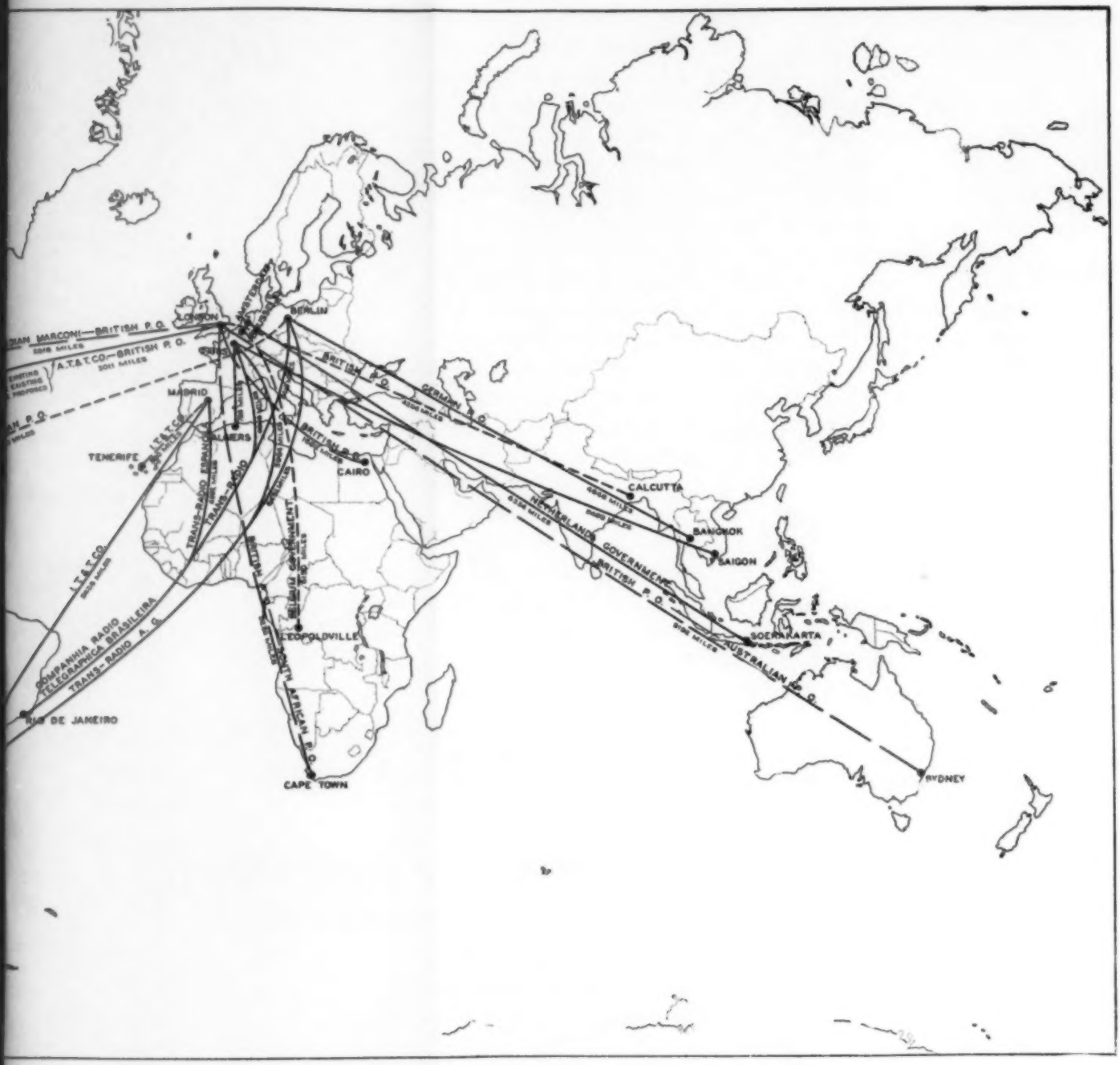
Presumably, for many years, the main group of these longer distance international circuits will be between the North American continent and Europe. The volume of traffic over the present transatlantic radio links and estimates of future growth show that ultimately more circuits will be required. There are now three short wave and one long wave two-way circuits between New York and London. Two new projects are actively under way. One, the establishment of a fifth two-way radio circuit which will be long wave, and the other a submarine telephone cable; this latter being made possible by recent developments in cable construction, including improved insulating and loading materials developed by the Bell Telephone Laboratories. These additional channels will increase both the speed and reliability of service on this important route.

There is now under way the establishment of a radio telephone station on the Pacific Coast near San Francisco, through which it is planned to extend service to the Hawaiian Islands and possibly to Australia, the Philippine Islands and the countries in the Far East.

Activities of Other Agencies

The foregoing are projects in which the Bell System is at present taking an active part or which can be said to be definitely in sight. Other nations are showing a lively interest in


AMERICAN TELEPHONE & TELEGRAPH COMPANY
RADIO TELEPHONE
COMMUNICATION CHART
OF THE WORLD
-APRIL 1930-
-CODE-
RADIO TELEPHONE CIRCUITS EXISTING
RADIO TELEPHONE CIRCUITS UNDER CONSTRUCTION
RADIO TELEPHONE CIRCUITS PROJECTED
LENGTHS OF CIRCUITS ARE GREAT CIRCLE
DISTANCES IN NAUTICAL MILES
A.T.&T.CO.
CANADIAN MARCONI—BRITISH P.O.
A.T.&T.CO.—BRITISH P.O.
GERMAN P.O.
AUSTRALIAN P.O.
COMPANHIA RADIO TELEGRAPHICA BRASILEIRA
TRANS-RADIO A.G.
TRANS-RADIO ESPANOLA
NEW YORK
SAN FRANCISCO
TOKIO
MANILA
HONOLULU
SYDNEY
MEXICO
BOGOTA
BUENOS AIRES
RIO DE JANEIRO
TENERIFE
MADRID
LONDON


LONDON
BERLIN
MADRID
CAIRO
CALCUTTA
BANGKOK
SAIGON
SOERABAYA
SYDNEY
CAPE TOWN
LEOPOLDVILLE
RIO DE JANEIRO
BRITISH P.O.
AUSTRALIAN P.O.
GERMAN P.O.
NETHERLANDS GOVERNMENT
BELGIAN GOVERNMENT
SOUTH AFRICAN P.O.
COMPANHIA RADIO TELEGRAPHICA BRASILEIRA
TRANS-RADIO A.G.
TRANS-RADIO ESPANOLA
TRANS-SAHARA
TRANS-CONTINENTAL
MARCONI—BRITISH P.O.
A.T.&T.CO.—BRITISH P.O.
A.T.&T.CO.
EXISTING
PROPOSED

extending their telephone service to various parts of the world and are developing other projects which it seems pertinent to list since even though connection with the Bell System may not now be contemplated they are links in the picture of world telephony. As such they may possibly be useful in some cases for tandem operation and in others the stations may be used for the establishment of direct circuits between the United States and countries in which they are located, if there is sufficient potential traffic to warrant the project, if the apparatus is or may be made suitable from a transmission standpoint, and if satisfactory arrangements can be made with the operating agencies involved.

British Empire

Radio telephone circuits are under construction or contemplated between the following points:

London to Montreal, Canada
London to Capetown, Africa
London to Sydney, Australia
London to Cairo, Egypt
London to Calcutta, India

France

Radio telephone circuits are in operation between Paris and the following points: Buenos Aires, Rio Janeiro, Algiers and Saigon, Indo-China. In the case of the Paris-Buenos Aires circuit connection at Buenos Aires is not made to the telephone system, conversations being from a booth in the offices of the operating company. However, at Paris the circuit is connected to the European telephone network.

Spain

A radio telephone circuit has been established between Madrid and Rio Janeiro and Madrid and Buenos Aires. At

Buenos Aires connection is made to the telephone system of Argentina and through that system to Chile and Uruguay. A further extension is proposed by radio telephony between Buenos Aires and Bogota, Colombia. Connections in Europe are limited to telephone subscribers in Spain. However, it is understood that connections probably will be extended to other European countries.

A radio telephone circuit is proposed between Madrid and the Canary Islands.

Germany

Telephone service is available over a radio circuit between Berlin and Rio Janeiro and between Berlin and Buenos Aires. As in the case of the Paris-Buenos Aires circuit no connection is made to the telephone system at Buenos Aires, conversations being from a booth in the offices of the operating company but at Berlin the circuit is connected to the European telephone network.

There have been reports of radio telephone experiments between Berlin and Asiatic countries. However, the only circuit reported in commercial service is between Berlin and Bangkok, Siam. Some experimental work has been done on a circuit between Berlin and Mexico City.

Belgium

A radio telephone circuit is contemplated between Brussels and the Belgian Congo.

Holland

A radio telephone circuit was recently placed in service between Amsterdam and Soerakarta, Java. This circuit now terminates in booths at both ends but work is under way to connect it to the telephone system in Holland and through it probably to the European network.

Channel Possibilities

With the exception of one long wave channel between New York and London and an additional long wave channel contemplated between these two points all other radio circuits, either existing or proposed, use or contemplate using the short wave portion of the radio spectrum. The short wave portion of the spectrum while vastly richer in channel possibilities than the long wave portion still has quite definite limitations as to the number of channels it affords. Moreover, any one of our transatlantic short wave circuits requires three frequencies for each circuit to provide continuous service over a 24 hour period. In our case we have found, for transatlantic operation, that a combination of short and long wave channels leads to far more reliable service than either portion of the radio spectrum used separately; hence our interest in the establishment of an additional long wave channel. The addition of a cable will also increase the reliability on the important New York-London route.

In international radio nations share a common transmitting medium. Recognition of this has resulted in the establishment of international means for coordinating frequency assignments through the medium of the International Radio Conferences, the most recent of which was held in Washington in 1927. Also, for the purpose of studying the many problems of international radio a committee was organized under the last radio convention called the International Technical Consulting Committee on Radio Communication, abbreviated, from the French, to C. C. I. R. The outstanding problem of this committee is to obtain world agreement on technical standards which will permit of deriving the maximum number of channels with the minimum of mutual interference.

Ship-to-Shore

Any review of world telephony should include a statement of the present status and possibilities of telephone service for

ships at sea. Ships with relatively large numbers of passengers are completely isolated for days at a time except for radio communication. The Bell System has been studying the possibilities of ship-to-shore telephone service for some years and in December, 1929, commercial service was inaugurated with the steamship *Leviathan* of the United States Lines utilizing a sending and a receiving shore station established for the purpose near New York. In April of this year service was established with the steamships *Majestic* and *Olympic* of the White Star Line and was subsequently extended to the *Homeric*. It is expected that Bell System service will soon be extended to other transatlantic ships and later to coastwise vessels. Probably a shore station for ship communication will be established on the Pacific Coast at no very distant date. Experiments in ship-to-shore telephony have also been carried on in Europe, notably in England and Germany. There has recently been established commercial service between the station of the British General Post Office and several transatlantic liners.

Conclusion

Radio is proving to be an effective pioneering means for the establishment of world-wide telephone communication because it furnishes a ready method of connecting countries which are separated by natural barriers over which wires either cannot now be placed or can be placed with so great difficulty as not to be economically justified.

In some cases, such as between Europe and Africa and between the United States and South America, the barriers consist principally of large land territories which are little developed commercially. With the future industrial development of these countries and the building of railroads and highways it may reasonably be expected that telephone networks will be built up to serve at first the needs of the separate countries and later these networks will be interconnected making through wire telephone routes available.

In other cases, such as between North America and Europe and between North America and Asia, the barriers consist of broad expanses of ocean. Under these conditions wire circuits are at a large disadvantage. However, as already noted, recent developments have now made possible a telephone cable between America and Europe and plans for its construction and laying are going actively forward. It is not being placed, however, with the idea that cables of this type would be economically justified for all the traffic between this country and Europe but rather that it will increase the reliability of a service which will also depend on long wave and short wave radio circuits. For the long distances involved in connecting this country with the important countries across the Pacific the technical and economic difficulties of cable would, of course, be increased. The parts which cable and radio will ultimately play in spanning these ocean barriers will depend, of course, on the developments that it is found possible to make in both radio and cable facilities. It seems reasonable to expect, however, that radio will continue to have a very important field of usefulness under these conditions.

For mobile services, of which at present ship-to-shore communication is the outstanding example, radio is clearly the only means available.

ELAM MILLER.

Trade Mark Service in Classified Telephone Directories Contributes to Modern Merchandising

MODERN merchandising in this more complicated age of living depends largely on a comprehensive, well-planned advertising program which creates in the minds of the buying public a desire for the advertised product. Manufacturers have realized for a long time that although the brand names of their products have been well established in the minds of the readers of their advertising by these comprehensive advertising programs, their chain of marketing effort is incomplete in that it does not tell the prospective purchaser where the product can be bought.

Under these modern conditions of marketing, the prospective consumer is looking for some standard product to which his attention has been called by national advertising. He is looking not merely for a jeweler, but for a particular make of watch; not merely for a candy store, but for a special brand of chocolates; not merely for an automobile dealer, but for the agency of the particular car he wishes to buy. Of course, the advertisers of standard products cannot include the names of all their local dealers in advertisements of national circulation. The limitations of space forbid. And so, even after national advertising has successfully aroused the desire to buy, the prospective purchaser has all too often been left to wander disconsolately from store to store seeking the advertised product until he finally, in discouragement, gives it up and allows somebody to sell him "something just as good."

This constitutes a very serious hiatus in the smooth flow of distribution from producer to consumer. National advertising informs the reader of the merits of a certain product, of the advantages accruing to the owner and creates successfully,

thereby, a desire to buy. But national advertising falls short of completing the sale, for it can only tell the reader what to buy, it cannot tell him where to buy it.

Realizing that the solution to this modern merchandising problem might be found in the most comprehensive buyer's guide published in this country—the Classified Telephone Directories of the Associated Bell Telephone Companies—the

Gruen Guild Watches
You will find Gruen Guild Watches — men's wrist and pocket watches; women's gold and diamond set wristlets — at the Member Guild Jewelers listed below.
GRUEN WATCHES
"WHERE TO BUY IT"
Alsted-Kasten Co Inc 123 Wis av.....DA ly-1544
Bloedel's Jewelry Inc 215 Wis av..MA rquette-3078
Bunde & Upmeyer Co 101 Wis av....DA ly-0760
Durner George 745 3rd.....LO cust-0148
Jewelers—Retail—Cont'd
GROSS MAX INC
DIAMONDS—WATCHES
Credit? Why Certainly!
"The Old Reliable"
MAX GROSS, INC.
616 Wisconsin av.....MA rquette-1782
Grossman Philip 211 3rd.....MA rquette-5482
Gruen Guild Watches—For names of dealers see heading Gruen Guild Watches

Trade Mark Heading Cross-referenced under a General Heading

American Telephone and Telegraph Company conducted an investigation which extended over several years. The objective of this study was to determine how to make the classified telephone directories of the greatest possible usefulness to business men and consumers alike. As a result there was developed the Trade Mark Where to Buy It Service, now available to manufacturers throughout this country and Canada. Another Bell System Service was thus added to those already in use by the public.

The Service is very simple in form, method of purchase and operation. Trade Mark Service for any one manufacturer consists of inserting the name of his product in the classified telephone directory, in towns where he has dealers, together with a list of his authorized dealers with their addresses and telephone numbers. Typical Trade Mark Headings and their associated dealer listings as they appear in the classified telephone directory will be found in the illustrations on this page and on page 201.

COUNTRY CLUB DAIRY
PASTEURIZED — WHITE LIST MILK — RAW
HIland 8000 5633 Troost Ave.

Curtain Cleaners

Curtains — Overdrapes — Blankets
COMFORTS—FANCY LINENS—SPREADS
4726-32 Forest VA lantine 7900
(2 Trunk Lines)

AMERICAN CURTAIN LAUNDRY
BEDSPREADS - DRAPES-BLANKETS - QUILTS - LINENS - RUGS
1316-20 W. 41st We Call & Deliver LO gan 4824

City Curtain Cleaners
Successors to K. C. Curtain Cleaner.
Bell Phone System
2601 Indiana LInwood 3396

City Curtain Cleaners 2601 Indiana.....LI nwood 3396
COUNTRY CLUB LAUNDRY
5633 Main.....VA lantine 3900

DARGILS SPECIALTY LAUNDRY
3441 Prospect Ave. t-1 LInwood 6700

KATE HINKLE'S
FRENCH LAUNDRY
LACE CURTAINS - - FANCY LINENS
3121 Gillham Rd. Established 1907 WEstport 1300

Alma Lace Curtain Clg Co 4738 Forest....VA lantine 7900
McMILLEN T S MRS 5116 E 18th St.....BE ston 1176
Modern Lace Curtain Cleaners 600 E 18th St...GR and 2770

STAR RUG & LACE CURTAIN CLEANERS
Everything Laundered 100%
BE shw 7058 2115 Indiana Ave.

WESTPORT LAUNDRY CO
3043 Central.....WE stport 1464

Curtain Manufacturers

Brooks Curtain Corp 3009 Walnut.....HA rrison 4399
Maxwell Vogue Curtains 332 W 9th.....HA rrison 6483
U S Manufacturing Co 906 Central.....HA rrison 2254

Cut Stone Contractors

Rock Cut Stone Co 2157 Brooks Rd.....LO gan 3434
K C Cut Stone Co 5th & Cherry.....VI ctor 7109
Phoenix Cut Stone Co 10th & Olive.....CL ifton 4041
Rockwood & Stone Co Troost & 39th Line..HA rrison 0462

Cutlery

Clark Bros Cutlery Co 312 E 11th.....HA rrison 1188
MEDKEL GRAS 607 Main.....VI ctor 7002
Waterville Cutlery Co 312 E 11th.....HA rrison 1188

Cuts

AMERICAN CUT & MATRIX CO
610 Delaware.....VI ctor 8502
BURGESS-BAIRD ENGRAVING CO
715 E Graphic Arts Bldg.....HA rrison 4130
KANSAS CITY ENGRAVING & COLORPLATE CO
8th & Walnut Sts.....VI ctor 4707

Cylinder Grinding

BROWN W W MACHINE WORKS
127 Sw Blvd.....GR and 0414
INTERNAL MOTOR PARTS & CYLINDER RESIZING CO
1183 Walnut.....GR and 1290
Internal Motor Parts & Cylinder Resizing Co
1183 Walnut, GR and 1290
Johnson Walter D 121 E 19th St.....HA rrison 1574
Kilva Welding & Machine Works 1826 Grand..HA rrison 4397
WEIK MACHINE WORKS 1423 McGee.....VI ctor 3537
TOBIAS MACHINE WKS 511 E 19th.....HA rrison 4463
WHEATLEY BROS So 39th & Broadway..HA rrison 4446

Dairies

SUMME DAIRY CO.
QUALITY AND SERVICE
WE DELIVER TO YOUR HOME
RETAIL AND WHOLESALE
LInwood 7565

AINES FARM DAIRY
"Quality Beyond Question"
VA lentine 3880

★Aines Farm Dairy Co 3110 Gillham Rd..VA lantine 3880
Aines Farm Dairy Co Garage 3720 Cherry....GR and 5476
Alleton Dairy Co 1709 N 7th.....FA irfax 5144
★Arctic Dairy Products Co 415 W 18th.....HA rrison 5855
Bolles Farm Dairy 746 Central.....DR exel 0685
Blue Ribbon Creamery 746 Central.....DR exel 0685
Budd Park Dairy 39th & Broadway.....JA ckson 0802
Campbell Dairy Co 330 E 14th.....VI ctor 3498
Cedar Brook Dairy Farm 39th & Broadway..JA ckson 0802

CHAPMAN DAIRY
Retail: VI ctor 9620
Wholesale: VI ctor 9624

★Chapman Dairy Co
Wholesale Dept 1207 Locust.....VI ctor 9624
South Station 1510 E 63rd.....WI lmot 5620
Retail Dept 1207 Locust.....VI ctor 9620
East Station 6000 E 12th.....CH erry 5620
If no answer call.....VA lentine 7134
Clover Dairy 1000 E 41st.....LO gan 6900
Co-Operative Dairy Assn 3105 Gillham Rd..VA lantine 3126
Cook Dairy 816 W Lexington.....GR dependence 3099
Country Club Dairy Co 5633 Troost.....HI land 8000
Dried Star Buttermilk Co 3111 E 18th.....CL ifton 1735
Dryden Farm Dairy Noble Rd.....GR dependence 66 R13
Elm Park Dairy Noland & Phelps Rd..GR dependence 53 R2

ETEM DAIRY
CLEANLINESS — RICHNESS
HIckman 74 Hickman Mills, Mo.

Fiume-Bells Farms 3½ mi So Leeds.....LE eds 1906 R2
Forest Dairy Co 531 Forest.....VI ctor 7516

FORSEN DAIRY
WE DELIVER TO YOUR HOME
BREAKFAST SERVICE
1720 QUINDARO BLVD.
Phone FAirfax 4613

Forsen Dairy 1720 Quindaro.....FA irfax 4613
Harmony Hill Dairy S Noland Blvd..GR dependence 25 R6

HILLROSE FARM
WHITE LIST MILK
PAUL MATTHEY
Phone Overland 106
Call Long Distance or Dial Operator

★Home Dairy Co 3106 Gillham.....VA lantine 3126
Indep Pure Milk Co 415 S Spring...GR dependence 3376
Jersey Needs Farm Dairy North K C..GR eldridge 1413 R2
K C Milk Producers 4000 Troost.....WE stport 2525
Long R F 834 Arlington.....GR dependence 5400
Northeast Dairy Co 830 Troost Av.....VI ctor 7726
Primrose Farm Dairy 3106 Indep Av.....BE ston 3966
Stone Dairy Co 4510 Prospect.....WA lnut 2650

SCHELLCREST FARMS
FRED P. SCHELL, Jr.
WHITE LIST MILK Raw Pure Rich Delicious
BABIES A SPECIALTY
Phone VI 3066 Or call LONG DISTANCE Liberty Mo., 46 F 11

Sheffield Farm Dairy 1838 Locust.....VI ctor 4657
Sol-A-Rae Dairy Farm
1416 E Pleasant..GR dependence 3231
Summe Dairy Co 6118 E 27th.....LI nwood 7565
Superior Farm Dairy 3716 Indep Av.....CL ifton 1292
Thoroff & Dodds Creamery Co 330 N 7th.....DR exel 4490
Westport Dairy 4017 Penn.....VA lantine 4206

MAPLE CREST FARM
Wood Bros.
WHITE LIST MILK
Phone Overland 80
Call for Long Distance or Dial Operator

Dairy Supplies

De Laval Sales & Service Co 1319 W 12th...HA rrison 1554

K. C. SOLDERING & RETINNING WORKS
Milk Cans, Dairy Equipment
Repaired and Retinned
GRand 1312 1907 Holmes St.

KENNEDY H A SUPPLY CO 1211 W 12th HA in 1070
Lowry Sales Corporation 114 Delg Bldg.....HA rrison 6477

A Classified Telephone Directory Page before the New Typography Was Adopted

Laundries—Continued

Wisconsin Family Laundry
344 Madison. HA nover-1214
(See Advertisement This Page)

WONDER SERVICE LAUNDRY
873 Kinnic av. SH ordan-1520

Wood's Laundry Inc 3100 North av. KI ihorn-0400
(See Advertisement Opposite Page)

Laundry Dryers

Apartment Laundry Dryers

WISCONSIN SALES & SUPPLY CO
137 6th. MA rquette-4100

Laundry Machinery Mfrs

American Laundry Machine Co
251 26th. WE ri-1741

Kuebuch Mfg Co 61 Center.....LO cust-5998
Prosperity Co Inc 1417 Wells..MA rquette-6467
Troy Laundry Machinery Co Ltd
635 Cramer. LA kside-0812

Vaughan Co 56 S Bay.....SH ordan-6153
Welded Products Mfg Co
2307 Elmwood av. CU ddy-0594

Caster Equipment

ROLSON-CHICAGO CO 218 W Water..DA ly-4222

Laundry Owners Ass'n

Members of the Laundry Owners Association own their own plants and are pledged to Service, Health and Sanitation. Affiliated with National Association.

"WHERE TO BUY IT"

American Laundry 214 Wells....MA rquette-2071
Big 4 Laundry Corp 847 30th.....WE ri-2139
Bulkley Laundry Co 2110 Galena...WE ri-0634
Campbell Laundry Co
714 Michigan. MA rquette-6185

Cream City Laundry 491 Broadway. BR odwy-0230
Kut-Klosline Home Laundry
2014 Center. KI ihorn-0084

Hubbmer Laundry Co 215 Garfield av LO cust-0187
Hudnuh Laundry Co
868 Arlington pl. LA kside-4818

Ideal Laundry Co 1520 Wells....MA rquette-2175
National Family Laundry Co
617 Null av. MI schff-5308

New Way Service Co 1027 North av. KI ihorn-8900
North Ac Family Laundry
344 E North av LA kside-5900

Northwestern Laundry Co
2401 North av. KI ihorn-5635
Quality Laundry Service Inc 2900 Vliet. WE ri-8000
Reliance Laundry & Cleaning Co
617 Null av. GR chard-0617

Right Laundry The 124 Howell av...HA nover-0396
Sunshine Laundry Inc 1107 Wells. MA rquette-3333
Tenth Time Laundry Co
873 Kinnic av. SH ordan-1520

Standard Laundry Inc 1518 Clybourn. WE ri-2858
Tuhl's Hand Laundry 125 E Wells... DA ly-0252
Vaughan Atlantic Laundry Co
576 E Water. DA ly-4780

Wood's Laundry Inc 3100 North av. KI ihorn-0400

Laundry Supply Dealers

LELAND CHEMICAL CO INC
250 Mile. DA ly-0642

MERCHANTS CHEMICAL CO INC
430 Barclay. HA nover-5430

Phenolic Products Co 161 Chicago. BR odwy-4462
Sunshine Soda Co 218 Florida..BR odwy-8362

Lawn Equipment Dealers

Brooks of Wis 714 Oakland av....LA kside-2601
EVERSON DICK 2143 Ft Wash rd. ED gwood-5064

Lawn Mower Mfrs

Power Lawn Mowers

Modern Machine Works Inc 192 Mitw...DA ly-6536
(See Advertisement This Page)
EVERSON DICK 2143 Ft Wash rd. ED gwood-5064

Lawn Mower Repairers

Ryerson Dick 2143 Ft Wash rd....ED gwood-5064

Grinding Lawn Mowers

SCHWALBE BROS
Lawn Mower Grinding and Repairing
Guaranteed Work
Done at Your Home
CALL BETWEEN
6-8 A. M. or 4-8 P. M.
814 6th.. . . . . CS mord-0380

Lead

Fittings, Lead

Crown Metal Co 255 Washington..HA nover-1754

Products, Lead

WINDSOR MFG CO 544 Clinton..HA nover-0375

Sheet Lead

Crown Metal Co 255 Washington..HA nover-1754

Leather Goods Dealers

BURROUGHS BDW COMPANY
Edward S. Burroughs, Mgr.
20 Years With George Burroughs & Sons
QUALITY LEATHER GOODS

Bags	Hat Boxes
Brief Cases	Men's Purses
Trunks	Suit Cases
Gladstones	Portfolios
Ladies' Purses	Leather Specialties

Sample Room and Sales Office
2098 Pinkerton Am. Bldg.
133 Wisconsin av.....DA ly-1185

BURROUGHS GEO & SONS
450 E Water. DA ly-5614
Cawn Bros 476 11th.....HA rquette-1109

ELSNER A G & SONS
"The Leather Goods Stores"
TRUNKS—SUIT CASES
TRAVELING BAGS
—Repairing—
Two Big Stores
208 Wells.....MA rquette-5143
417-19 Jones av.....MA rquette-1894

IRON DUKE TRAVEL THINGS CO
373 E Water. DA ly-4879
Linden Linen & Leather Clothing Co
1059 5th. LO cust-1748

Lim C J 81 E Wis av.....BR odwy-0365
LOEPS HARRY G 450 E Water.....DA ly-5614
Martynski Anton 491 Mitchell....HA nover-2291
McKern-Limi Co 81 E Wis av. ..BR odwy-0365
Milwaukee Leather Products Co
1304½ E Wells. BR odwy-2365
National Trunk Store 813 Wis av...GR and-0181
(See Advertisement This Page)
Benedix's Retail 81 E Wis av....BR odwy-0365
Seligmann S & Co 440 Milwaukee.... DA ly-4058
South Side Strap Co 2519 Greeley..HA nover-4676
Yenter J B & Son 261 W Water . GR and-8120

Wisconsin Family Laundry

Tel. HA nover 1214

The Newest Laundry in Town

Wet Wash, 20 lbs. $1.00
Week End Special, 25 lbs. $1.00

Hydro, 20 lbs. $1.30
Week End Special, 25 lbs. $1.30
Flat Pieces Ironed, Wearing Apparel Returned Damp

Rough Dry, 20 lbs. $1.60
Flat Pieces Ironed, Wearing Apparel Air Dried

344 Madison St.

Red E POWER LAWN MOWERS

FOR LAWNS EVERYWHERE

Simplicity in Construction

Easy to Operate

Lawns must not be neglected. They should be kept smooth and closely cut. The Red E Mower is just the thing for this purpose. It runs over the lawn quickly and efficiently. It does a good job, and requires little work on your part.

Guaranteed—Ask for Demonstration

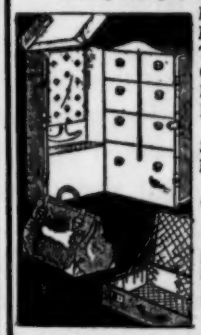
Made in Milwaukee by

Modern Machine Works, Inc.
192-94 Milwaukee St.

Tel. DA ly 6536

LEATHER GOODS

We carry a complete line of:



Hand Bags
Brief Cases
Trunks
Gladstones
Hat Boxes
Men's Wallets
Suit Cases
Ladies' Purses
Catalogue Cases
Umbrellas
Leather Specialties
Fountain Pens and Novelties

"If It's Made of Leather We Can Repair It"
Repairing of Umbrellas and All Leather Goods

NATIONAL TRUNK STORES
613 WISCONSIN AVENUE
Tel. GR and 8985
98 E. WISCONSIN AVENUE
BR oadway 8630

A Classified Telephone Directory Page in the Modern Style, Showing a "Where to Buy It" Listing

The adoption of Trade Mark Service in classified telephone directories makes it possible for the manufacturer to refer to his local dealers in his national advertising—something which he could not readily do before. In his national, regional or local advertising he can incorporate a reference similar to the following:

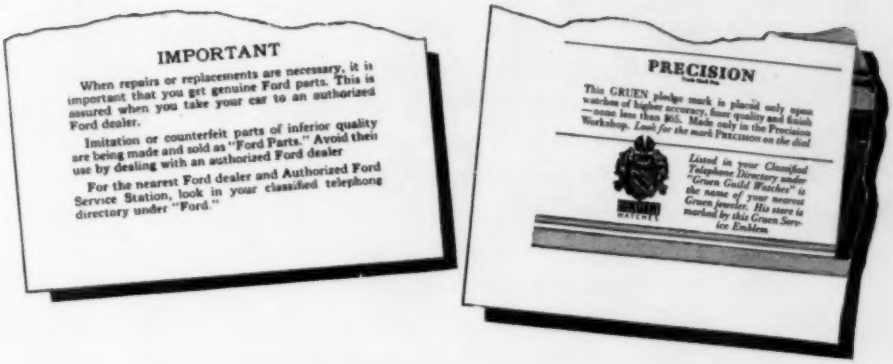
> "Your nearest dealer is listed in your local Where to Buy It Classified Telephone Directory under—(brand name)"

The illustration on the opposite page shows several such references contained in advertisements which have appeared in leading periodicals with national circulation, and a similar note printed in an automobile manufacturer's instruction book.

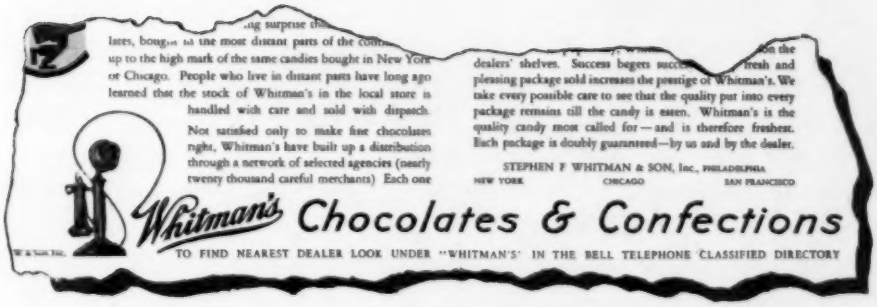
Trade Mark Service is now available in the telephone directories which are in use in more than 24,000 cities and towns in the United States and Canada. All or a desired part of these towns, to match the distribution of a particular product, can be covered in a single contract. The circulation of the directories is now more than 16,500,000 copies which are delivered free of charge to homes and offices with telephones.

The opportunity for the telephone companies to render this additional service to the public came with the development of the modern telephone directory which has been called the "most used and most useful of books." Through the establishment years ago of classified telephone directories, it was made easy and convenient for any prospective purchaser to find "a butcher, baker or candlestick maker" to supply his needs. Business men, too, were thus given an opportunity to let the prospective customer know they were in the business of supplying the particular kind of goods or service for which he was looking.

To make the directories of greater value to these business men and subscribers, improvements have been made in classified telephone directories during the last few years. Among these improvements have been the "conversion" of all classi-


IMPORTANT
When repairs or replacements are necessary, it is important that you get genuine Ford parts. This is assured when you take your car to an authorized Ford dealer.
Imitation or counterfeit parts of inferior quality are being made and sold as "Ford Parts." Avoid their use by dealing with an authorized Ford dealer
For the nearest Ford dealer and Authorized Ford Service Station, look in your classified telephone directory under "Ford."
PRECISION
This GRUEN pledge mark is placed only upon watches of higher accuracy, finer quality and finish —none less than $65. Made only in the Precision Workshop. Look for the word PRECISION on the dial
Listed in your Classified Telephone Directory under "Gruen Guild Watches" is the name of your nearest Gruen Jeweler. His store is marked by this Gruen Service Emblem

Change THE PISTON RINGS
WHERE TO BUY IT
In the larger towns and cities, you will find your nearest Perfect Circle jobber or distributor listed in the Classified Section of your telephone directory, under the heading "Perfect Circle"
WHEN thick, blue smoke pours from the exhaust, it's a sign that the piston rings are wornout or inferior, thus causing the motor to pump oil! You can stop this waste of oil and restore new-car performance by installing a complete set of PERFECT CIRCLE Oil-Regulating and Compression rings—the rings used by most car manufacturers for original equipment, and replacement.
THE PERFECT CIRCLE COMPANY · General Offices · Hagerstown, Indiana
America's Oldest Volume Producer of Piston Rings
Plants: Hagerstown, Newcastle, Tipton, Ind. Export Offices: 549 W. Washington St., Chicago


dealers' shelves. Success begets success
fresh and pleasing package sold increases the prestige of Whitman's. We take every possible care to see that the quality put into every package remains till the candy is eaten. Whitman's is the quality candy most called for—and is therefore freshest. Each package is doubly guaranteed—by us and by the dealer.
STEPHEN F WHITMAN & SON, Inc., PHILADELPHIA
NEW YORK CHICAGO SAN FRANCISCO
Whitman's Chocolates & Confections
TO FIND NEAREST DEALER LOOK UNDER "WHITMAN'S" IN THE BELL TELEPHONE CLASSIFIED DIRECTORY

Typical References to Trade Mark Service Contained in National Advertising and in an Automobile Instruction Book

fied directories to a new and better standard of typography, a better arrangement of the display advertising, and revision of the classifications to make for greater ease of reference and completeness of the buying service. The illustrations on pages 200 and 201 show the striking difference between the old classified telephone directory page and the new converted one. These changes were made with a view to improving the reference value of classified telephone directories as buyers' guides.

Manufacturers are using the Trade Mark Service for a variety of reasons. An automobile manufacturer, for example, who has built up an extensive, well trained and well equipped service organization, is using the Service because he realizes that, no matter how good his service stations may be, they are of little use to the automobile owner unless one can be readily found when needed.

Another manufacturer is concerned with dealers who are trading on his advertising in an undesirable way. Such a dealer puts up on the outside of his building a sign with the advertised trade name of this manufacturer's product. He then lays in a small part line stock of the product in question and a complete stock of a less known line on which his profits are greater, and which he will substitute for the advertised product whenever the buyer permits. Trade Mark Service solves this problem to a large degree since the manufacturer can arrange to list under his Trade Mark only such dealers as he approves. The Service is thus an aid to the manufacturer in directing prospective customers away from the part line and "sell-you-something-just-as-good" dealer.

Trade Mark Service also reduces to a minimum the sales which are lost when an interested prospect "postpones" a purchase because he does not know where to buy the product. Furthermore, it reduces the number of sales which are lost through the indifference of the dealer with regard to the use of signs, window displays and other means for tying up to the demand for the product that has been developed by the manu-

facturer's national advertising. It is also an aid in strengthening the manufacturer's dealer organization, adding new dealers and dropping the non-profitable dealers. When properly "merchandised" to the dealer the Service can be used to reduce dealer turnover. In general, dealer and consumer goodwill can be improved and made more certain of retention by the use of Trade Mark Service, and above all, Trade Mark Service gives a local value to national advertising which has never before been attained. The dealer is identified by name with each of the manufacturer's national advertisements.

The solution to these problems of merchandising is an active interest of the Bell System. Several years have been spent in developing and perfecting a solution which is just beginning to bear fruit in the form of Trade Mark Merchandising Service—another contribution of the Bell System to the vast scheme of modern American intercommunication and merchandising.

HUGH W. MACNAIR.

The First Telephone Switchboard and Its Method of Operation

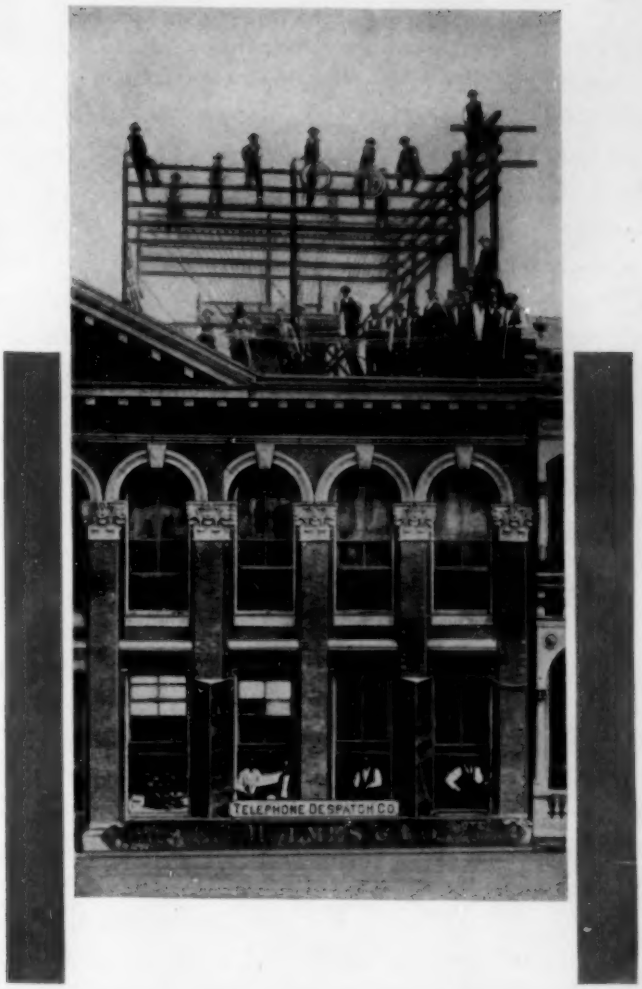
THE first interconnection, through a switchboard, of lines equipped with telephones, occurred at the central office of the Holmes Burglar Alarm Company, in Boston, in May, 1877. Pictures of the plug and block apparatus used at this time have been printed on many occasions, and the circumstances of its use have been referred to in several published books and articles. So far as the writers are aware, however, the complete central office and substation connections, and the method of handling a call, have never been publicly described. It is the purpose of this article to make available this information, the essentials of which were obtained many years ago from the late E. T. Holmes. Before taking up the method of operation of the switchboard, however, it will be helpful to review briefly the events leading up to its installation, as related by Mr. Holmes in his book, "A Wonderful Fifty Years."

In May, 1877, Mr. Holmes was conducting a burglar alarm business in Boston, with a central office at 342 Washington Street (Fig. 1), from which burglar alarm lines radiated to a number of banks and stores. At this central office a galvanometer was provided for each subscriber's line, so connected that if the apparatus at the subscriber's station should show a variation in resistance or an open circuit, a local contact would be closed, causing an annunciator drop to fall and a bell to ring. At each subscriber's station there was, in circuit with the vault or safe wiring, a key for transmitting signals to the central office and a bell for receiving signals from the central office. This system was only in use at night, and was disconnected during the daytime.

Mr. Holmes was keenly interested in the box telephones which were being constructed and experimented with at the shop of Charles Williams, Jr., at 109 Court Street, and persuaded Gardiner G. Hubbard to let him try them out on his burglar alarm lines. Within the next few days, five box telephones were delivered to Mr. Holmes, four of which were installed at the premises of the National Exchange Bank; the Hide and Leather Bank; the Shoe and Leather Bank; and Brewster, Bassett and Company, bankers. The fifth was installed at the Holmes central office. This telephone and the lines extending to the four banks were connected to a small telegraphic plug and block switchboard (Fig. 2), which had been made at Mr. Holmes' order. A fifth line was run from the switchboard to the shop of Charles Williams, Jr., and connected to a telephone there. After switches had been installed at the substations, for the purpose of connecting the subscribers' lines to either the substation burglar alarm circuits or box telephones, Mr. Holmes was in possession of a small experimental exchange with five subscribers, whose lines were repeatedly interconnected, and many conversations were exchanged, the burglar alarm apparatus being employed to transmit the call signals.

A public exhibition of the working of this system was given on May 17, 1877, on which occasion spectators assembled at the banking offices of Brewster, Bassett and Company talked with the Holmes central office and the Williams shop, and cornet solos, played at the Holmes office, were plainly heard at the other two points. This exhibition was noted in the Boston "Evening Transcript" of the following day, which reported that "conversation was carried on between the several points connected with perfect ease."

This experimental exchange was discontinued after being in operation about two weeks. The original switchboard was preserved by Mr. Holmes, however, and is now in the Bell System Historical Museum at 463 West Street, New York City.



ORIGINAL TELEPHONE EXCHANGE SWITCH BOARD
PROPERTY OF E.T. HOLMES.
DESIGNED AND USED BY HIM IN THE
FIRST TELEPHONE EXCHANGE
BOSTON, MAY 1877

FIGURE 1 (Above). Building at 342 Washington Street, Boston, Mass., in which the central office of the Holmes Burglar Alarm Company was located

FIGURE 2 (Below). The first telephone switchboard. It was designed by Mr. E. T. Holmes, and used for the first interconnection of lines equipped with telephones. The plug and block switches are shown in readiness for a call to be made.

Coming now to the method of operation of the switchboard, Figure 3 is a circuit diagram showing the substation and central office apparatus and connections for the lines of two subscribers, *B* and *D*, the apparatus being shown in readiness for a call to be made. At the central office, the subscribers' lines were permanently connected to the top plates of the plug and block switches. (As will be seen from Figure 2, there were six of these switches, five of which were in use.) The central office burglar alarm circuits were permanently connected to the lower right-hand plates of these switches. The lower left-hand plates were connected together by a common tie wire. One terminal of the central office box telephone, *T*, was connected to this common tie wire, the other terminal being connected to a two-point switch, *S*, by means of which the telephone could either be grounded or placed in circuit with a flexible cord, *C*, terminating in plug *Q*. Plugs *P-b*, *P-d*, etc., were provided for connecting the subscribers' lines to either the central office burglar alarm circuits or to the box telephone, *T*, as desired.

At each subscriber's station was a two-point switch, by means of which his line could be connected to either his substation burglar alarm circuit or to his box telephone, as desired. For telephone operation, during the daytime, the bank vault or safe at the subscriber's premises was short-circuited, this short circuit being removed at night, when the burglar alarm system was in operation.

As will be seen from Figure 3, the system operated on a normally closed circuit, from ground at the substations, through the central office galvanometers, *G-b*, *G-d*, etc., battery *B-2* and ground. Subscriber *B*, desiring to talk with subscriber *D*, depressed key *K-B*, which momentarily opened the circuit through his central office galvanometer, *G-b*, causing its needle to deflect and close a local circuit through annunciator *A-b* and battery *B*-3, operating the annunciator shutter and closing another local circuit through vibrating bell *V* and battery *B*-3. Upon releasing key *K-B*, subscriber *B* at once moved his sub-

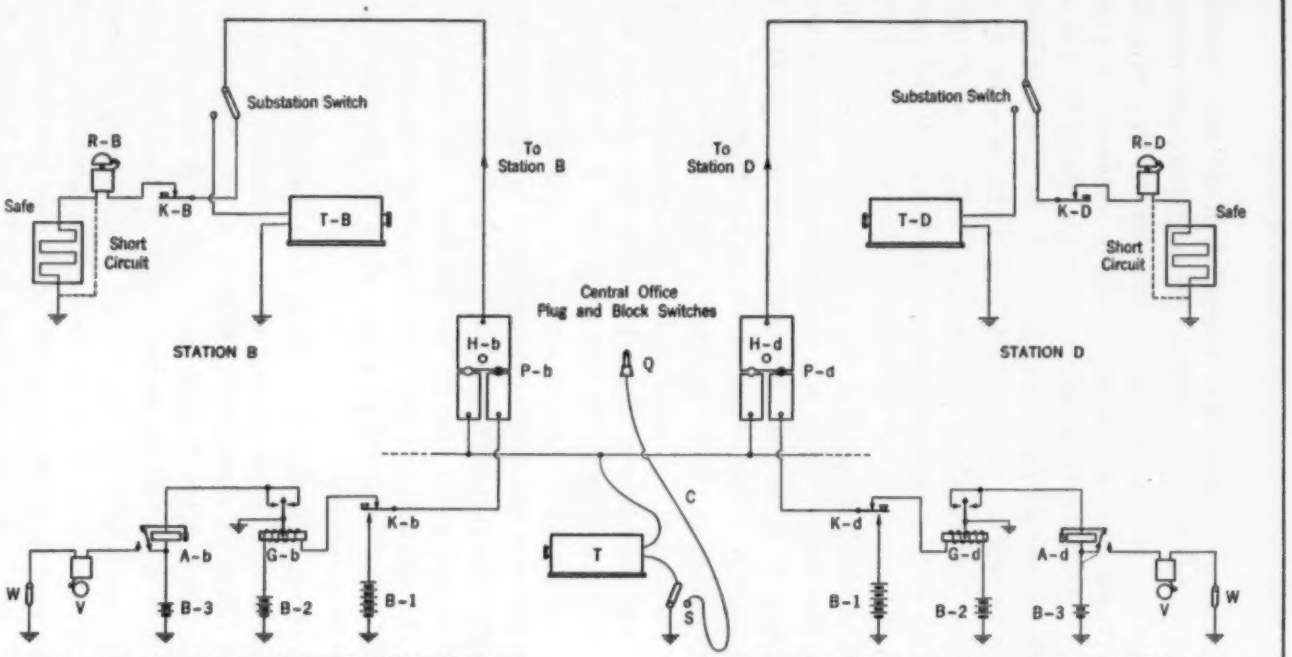


FIG. 3. - SUBSTATION AND CENTRAL OFFICE APPARATUS AND CONNECTIONS FOR TWO SUBSCRIBERS' LINES.
APPARATUS SHOWN IN READINESS TO RECEIVE A CALL

station switch from the right-hand to the left-hand contact, which disconnected his substation burglar alarm circuit from his line and connected in his box telephone, *T-B*.

The ringing of bell *V* (which was common to all of the central office annunciator circuits) and the operation of subscriber *B*'s annunciator, notified the operator that subscriber *B* desired to make a call. The operator first silenced bell *V* (and insured against its subsequent operation when one of the galvanometer circuits was again opened or unbalanced) by opening switch *W*. The operator's next act was to shift plug *P-b* from the right-hand to the left-hand hole, disconnecting subscriber *B*'s central office burglar alarm circuit and connecting the operator's telephone, *T*, in circuit with subscriber *B*'s telephone, *T-B*.

Upon learning that subscriber *B* wished to talk with subscriber *D*, the operator depressed key *K-d*, which first opened the circuit through subscriber *D*'s tap bell, *R-D*, allowing its striker to fall back, and then closed the circuit through heavy calling battery *B*-1, operating tap bell *R-D*. The operator then shifted plug *P-d* from the right-hand to the left-hand hole, disconnecting subscriber *D*'s central office burglar alarm circuit and connecting the operator's telephone, *T*, to subscriber *D*'s line.

When his bell rang, subscriber *D* moved his substation switch from the right-hand to the left-hand contact, thus disconnecting his substation burglar alarm circuit from his line and connecting in his telephone, *T-D*.

The operator, after notifying subscriber *D* that subscriber *B* wished to talk with him, removed plug *P-d* from the left-hand hole, moved switch *S* to its right-hand contact, and inserted plug *Q*, at the end of cord *C*, in hole *H-d*. This placed the telephones of subscriber *B*, the operator and subscriber *D* all in one circuit (Fig. 4). The operator could thus determine, by listening in, when the conversation was finished. When this occurred, the operator withdrew plug *Q* from hole *H-d*, re-

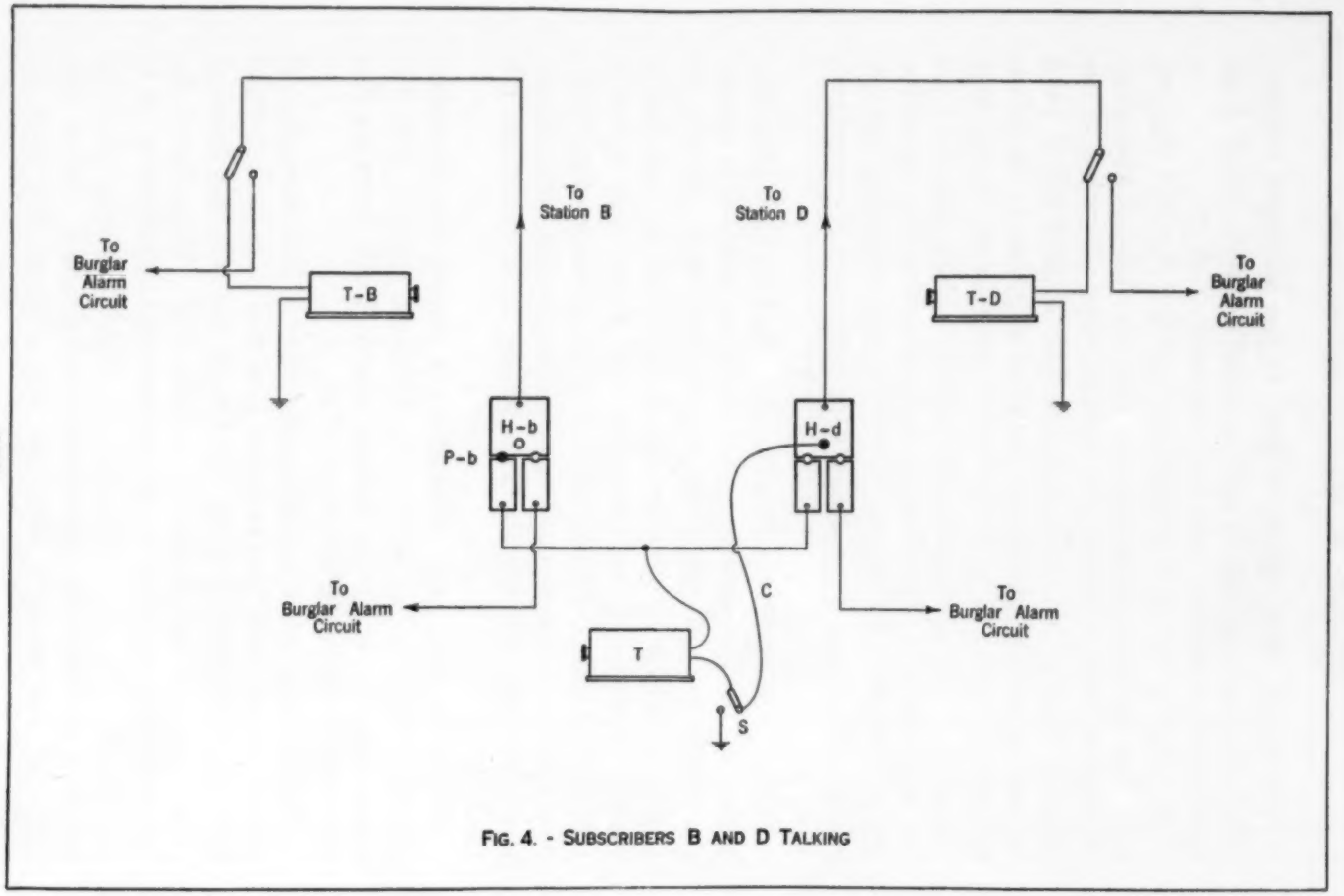


FIG. 4. - SUBSCRIBERS B AND D TALKING

placed plugs *P-b* and *P-d* in the right-hand holes of the central office plug and block switches, and moved switch *S* to its left-hand contact. When subscribers *B* and *D* had moved their substation switches to the right-hand contacts, the operator restored the shutters of annunciators *A-b* and *A-d* (the latter having fallen when its galvanometer circuit was opened), and closed switch *W*. The apparatus at the central office and substations was then in readiness for another call to be made.

G. K. THOMPSON,
R. B. HILL.

Note: The authors wish to express their indebtedness to Mr. W. L. Richards, Consulting Historian of the Bell Telephone Laboratories, for his assistance in the preparation of this article.

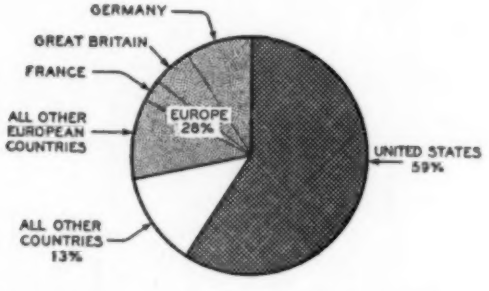
World's Telephone Statistics

January 1, 1929

ACCORDING to the latest annual survey of the world's telephones which was recently completed by the Chief Statistician's Division of the American Telephone and Telegraph Company, there were 32,712,284 telephones in the world on January 1, 1929. Fifty-nine percent of these, or 19,341,295 telephones, were in the United States. Twenty-eight percent of them, or 9,236,685 telephones, were in Europe; while Asia, Africa, Oceania and the entire Western Hemisphere outside of the United States, had the remaining thirteen percent, or 4,134,304 telephones.

DISTRIBUTION OF THE WORLD'S TELEPHONES

January 1, 1929

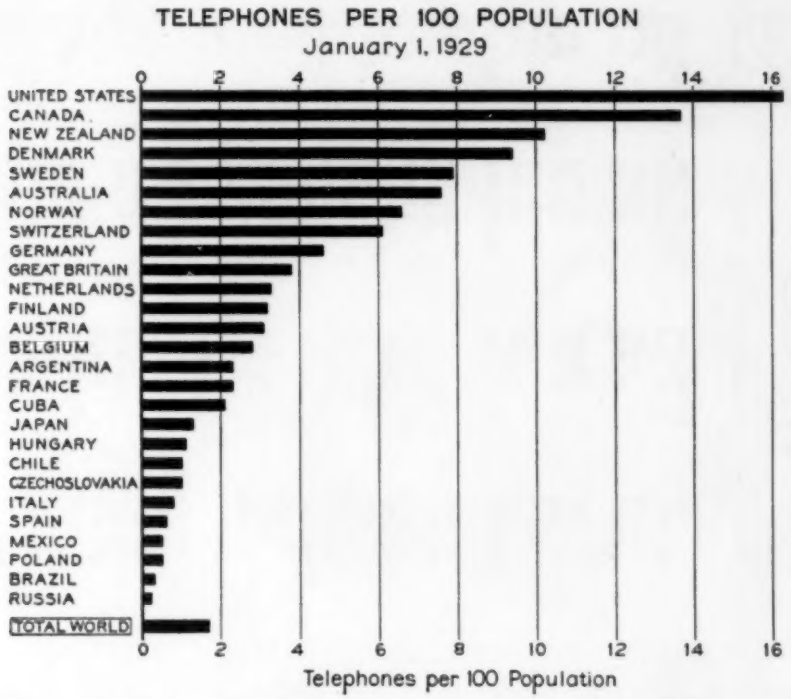


The results of the survey have been issued as a twelve page pamphlet entitled, "Telephone and Telegraph Statistics of the World, January 1, 1929," from which the accompanying tables and charts have been reproduced.

Comparative Telephone Development of Countries

During 1928 there was no change in the relative position of the principal countries as regards telephone development. The United States, with 16.3 telephones per 100 population, maintained its supremacy by a considerable margin. It is a

striking fact that, despite the impetus given to telephone development in foreign countries by the re-establishment of peace-time conditions, the number of telephones per 100 population in both Europe and the world as a whole has remained practically constant as one-tenth that of the United States. Canada, with 13.7 telephones per 100 inhabitants, was the second best developed country in the world, New Zealand was



third with 10.2, and Denmark fourth with 9.4 telephones per 100 population. It is significant in this connection that private companies operate all of the telephones in the United States, and 82 and 96 percent of the telephones in Canada and Denmark, respectively. In Europe, Germany had a development of 4.6 telephones per 100 inhabitants, less than one-third that of the United States. Great Britain had a development of 3.8, and France, 2.3 telephones per 100 people. In all three

TELEPHONE DEVELOPMENT OF THE WORLD, BY COUNTRIES
January 1, 1929

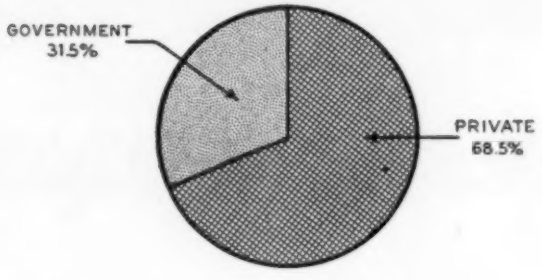
	Number of Telephones			Per Cent of Total World	Telephones per 100 Population	Increase in Number of Telephones During 1927
	Government Systems	Private Companies	Total			
NORTH AMERICA:						
United States	.....	19,341,295	19,341,295	59.13%	16.3	818,528
Canada	240,408	1,094,126	1,334,534	4.08%	13.7	74,547
Central America	11,365	12,292	23,657	.07%	0.3	1,146
Mexico	1,427	76,544	77,971	.24%	0.5	13,055
West Indies						
Cuba	506	73,207	73,713	.22%	2.1	4,885
Porto Rico	820	12,156	12,976	.04%	0.9	—246
Other W. I. Places*	8,896	11,086	19,982	.06%	0.3	1,609
Other No. Am. Places*	100	10,095	10,195	.03%	2.9	1,200
Total	263,522	20,630,801	20,894,323	63.87%	12.8	914,724
EUROPE:						
Austria	209,470	.....	209,470	.64%	3.1	44,239
Belgium	225,845	.....	225,845	.69%	2.8	29,154
Bulgaria	17,091	.....	17,091	.05%	0.3	2,733
Czechoslovakia	131,449	12,859	144,308	.44%	1.0	10,185
Denmark (March 31, 1929)	13,019	318,029	331,048	1.01%	9.4	6,816
Finland	1,000*	113,793	114,793	.35%	3.2	5,820
France	965,519	.....	965,519	2.95%	2.3	82,113
Germany	2,950,430	.....	2,950,430	9.02%	4.6	135,434
Great Britain and No. Ireland	1,759,686	.....	1,759,686	5.38%	3.8	125,884
Greece	9,345	.....	9,345	.03%	0.1	1,345
Hungary	93,159	.....	93,159	.28%	1.1	5,712
Irish Free State (March 31, 1929)	26,938	.....	26,938	.08%	0.9	1,621
Italy (June 30, 1929)	.....	333,057	333,057	1.02%	0.8	40,190
Jugo-Slavia*	35,000	.....	35,000	.11%	0.2	4,000
Latvia (March 31, 1929)	34,447	.....	34,447	.11%	1.8	4,444
Netherlands	255,489	.....	255,489	.78%	3.3	16,887
Norway	108,897‡	76,000	184,897	.57%	6.6	5,413
Poland	100,000*	74,410	174,410	.53%	0.5	17,000*
Portugal	6,500*	23,016	29,516	.09%	0.5	3,000*
Roumania	58,398	.....	58,398	.18%	0.3	2,374
Russia§	300,000	.....	300,000	.92%	0.2	40,000
Spain	.....	146,333	146,333	.45%	0.6	5,119
Sweden	484,045	1,706	485,751	1.48%	7.9	18,964
Switzerland	244,248	.....	244,248	.75%	6.1	20,651
Other Places in Europe*	88,330	19,177	107,507	.33%	1.2	10,000
Total	8,118,305	1,118,380	9,236,685	28.24%	1.7	639,098

SOUTH AMERICA:						
Argentina	.....	239,580	239,580	.73%	2.3	7,539
Bolivia	.....	2,683	2,683	.01%	0.1	71
Brazil	674	129,155	129,829	.40%	0.3	15,000*
Chile	.....	42,116	42,116	.13%	1.0	3,543
Colombia	54	22,346	22,400	.07%	0.3	1,290
Ecuador	1,454	3,551	5,005	.01%	0.2	598
Paraguay	183	880	1,063	.003%	0.1	650
Peru	.....	13,865	13,865	.04%	0.2	170
Uruguay	.....	28,129	28,129	.09%	1.6	1,195
Venezuela	668	13,965	14,633	.04%	0.5	1,535
Other So. Am. Places	2,719	.....	2,719	.01%	0.6	—19
Total	5,752	496,270	502,022	1.53%	0.6	31,572
ASIA:						
British India (March 31, 1929)	19,935	33,750	53,685	.17%	0.02	1,847
China*	100,000	55,000	155,000	.47%	0.04	10,000
Japan (March 31, 1929)	811,319	.....	811,319	2.48%	1.3	60,758
Other Places in Asia*	98,288	15,152	113,440	.35%	0.1	3,000
Total	1,029,542	103,902	1,133,444	3.47%	0.1	75,605
AFRICA:						
Egypt	43,224	.....	43,224	.13%	0.2	3,122
Union of South Africa†	102,308	.....	102,308	.31%	1.3	7,040
Other Places in Africa*	72,527	1,303	73,830	.23%	0.1	7,000
Total	218,059	1,303	219,362	.67%	0.2	17,162
OCEANIA:						
Australia‡	476,700	.....	476,700	1.46%	7.6	34,338
Dutch East Indies	45,201	4,000	49,201	.15%	0.1	3,203
Hawaii	.....	22,666	22,666	.07%	7.2	1,225
New Zealand (March 31, 1929)	152,541	.....	152,541	.47%	10.2	7,989
Philippine Islands	5,528	15,888	21,416	.06%	0.2	1,542
Other Places in Oceania*	3,298	626	3,924	.01%	0.2	450
Total	683,268	43,180	726,448	2.22%	1.0	48,747
TOTAL WORLD	10,318,448	22,393,836	32,712,284	100.00%	1.7	1,726,908

* Partly estimated.
† March 31, 1929.
‡ June 30, 1928.
§ U.S.S.R., including Siberia and Associated Republics; partly estimated.

of these countries the telephones are operated by the Government. Argentina, with 2.3 telephones per 100 population, headed the South American countries by a wide margin, and Japan with a development of only 1.3, had more than 70 percent of all the telephones in Asia. The relative positions of the principal countries of the world in point of telephone den-

OWNERSHIP OF THE WORLD'S TELEPHONES
January 1, 1929



sity is indicated by the chart, "Telephones per 100 Population."

The increase in the number of telephones in the world during 1928 was 1,726,908. Almost one-half of these, or 818,528 telephones, were added in the United States. The increase in Europe was 639,098 telephones, of which Germany added 135,434, Great Britain 125,884 and France 82,113 stations.

Telephones in Large and Small Communities

The extent to which the smaller communities in the principal countries are provided with telephone facilities, is indicated by the table, "Telephone Development of Large and Small Communities." It will be seen that in the United States, telephone service is made available to such an extent in its less populated sections, that, with the single exception of Canada, its development of 12.6 telephones per 100 people in communities of less than 50,000 population, exceeds the *total* telephone development of all other countries. The figures for the number of

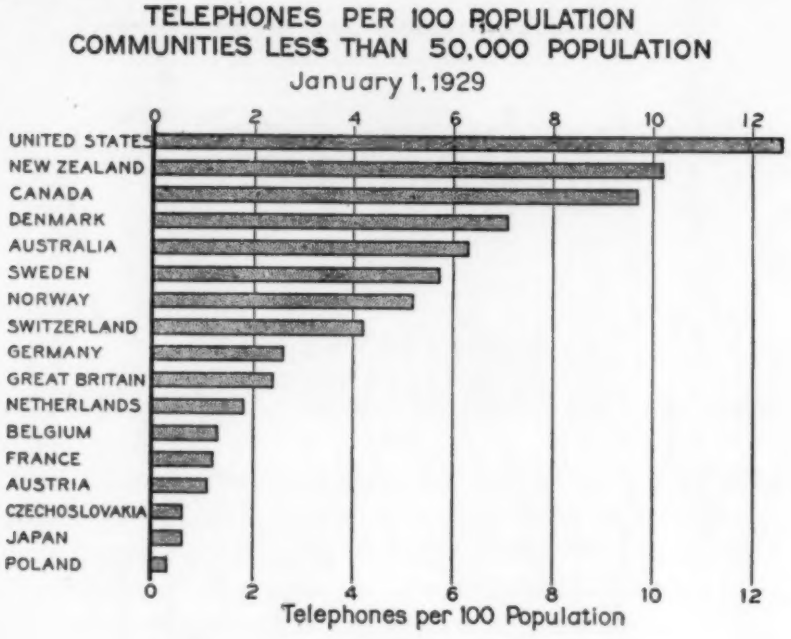
TELEPHONE DEVELOPMENT OF LARGE AND SMALL COMMUNITIES

January 1, 1929

Country	Service Operated by (See note)	Number of Telephones		Telephones per 100 Population	
		In Communities of 50,000 Population and Over	In Communities of less than 50,000 Population	In Comunities of 50,000 Population and Over	In Communities of less than 50,000 Population
Australia (June 30, 1928)*	G.	270,400	206,300	8.9	6.3
Austria	G.	158,805	50,665	6.9	1.1
Belgium	G.	162,027	63,818	5.0	1.3
Canada*	P. G.	686,000	648,534	24.2	9.7
Czechoslovakia	P. G.	58,507	85,801	4.2	0.6
Denmark	P. G.	146,311	184,737†	16.0	7.1
France	G.	566,681	398,838	6.4	1.2
Germany	G.	1,819,084	1,131,346	8.7	2.6
Great Britain and No. Ireland†	G.	1,280,871	510,423	5.3	2.4
Japan (March 31, 1929)	G.	516,188	295,131	3.6	0.6
Netherlands	G.	165,075	90,414	5.9	1.8
New Zealand (March 31, 1929)	G.	57,389	95,152	10.1	10.2
Norway	P. G.	60,713	124,184	15.0	5.2
Poland	P. G.	88,857	85,553*	2.4	0.3
Sweden	G.	192,217	293,534	20.4‡	5.7
Switzerland	G.	108,007	136,241	13.5	4.2
United States	P.	10,429,424	8,911,871	21.8	12.6

Note: P. indicates telephone service operated by private companies, G. by the Government, and P. G. by both private companies and the Government.
* Partly estimated.
† March 31, 1929.
‡ The majority of this development is due to Stockholm.

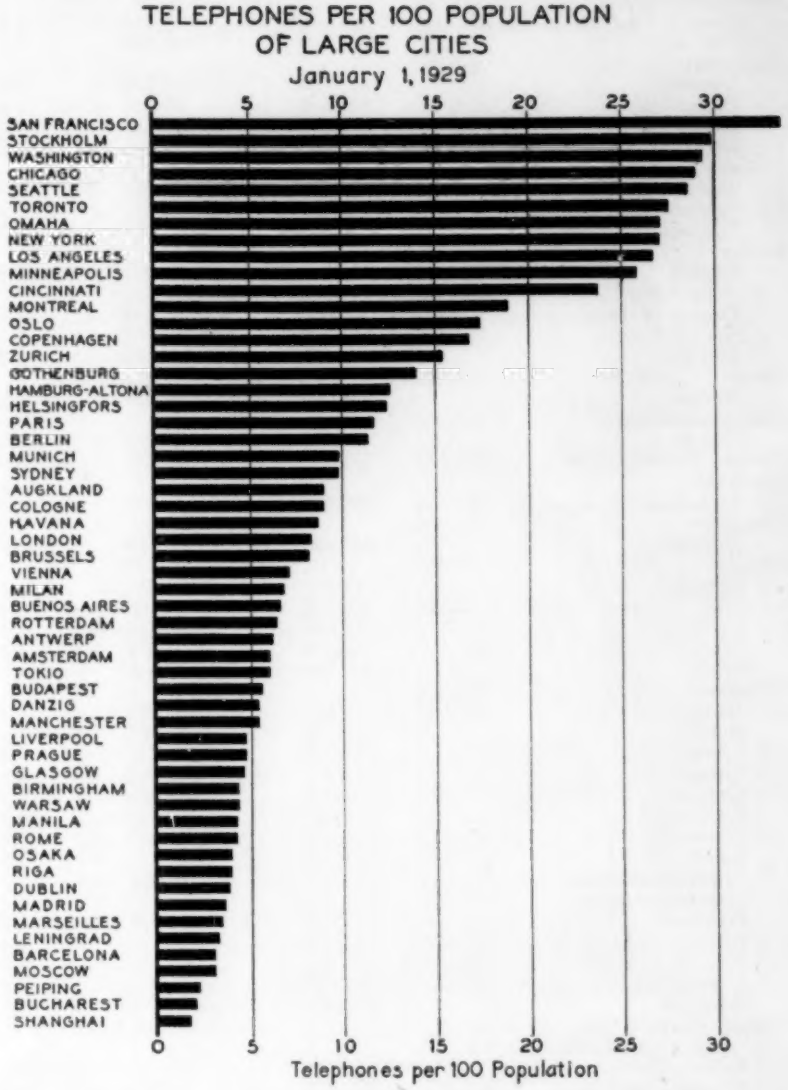
telephones per 100 inhabitants in communities of less than 50,000 population in the case of Germany (2.6), Great Britain (2.4), and France (1.2), show clearly that rural development in these large European countries is still practically insignificant when compared to similar development in the United States.



Telephones in Large Cities

The table, "Telephone Development of Large Cities," further emphasizes the extent to which the telephone service in foreign countries is concentrated in the more densely populated areas. Thus, on March 31, 1929, London had 626,714 telephones, representing more than 35 percent of all the telephones in Great Britain. Paris had 341,863 telephones, also more than 35 percent of the total telephones in France. More than a fourth of all the telephones in Germany were concentrated in the four main cities of Berlin, Hamburg-Altona, Leipzig and Munich. In striking contrast to this high concentration of

telephones in large cities abroad, New York City, with its 1,702,889 telephones had less than 9 percent, and Chicago



with 942,015 telephones had less than 5 percent, of the total telephones in the United States. Of the eleven large American

TELEPHONE DEVELOPMENT OF LARGE CITIES

January 1, 1929

Country and City (or Exchange Area)	Estimated Population (City or Exchange Area)	Number of Telephones	Telephones per 100 Population
ARGENTINA:			
Buenos Aires	2,056,000	135,037	6.6
AUSTRALIA:			
Adelaide	330,000	31,134	9.4
Brisbane	309,000	23,225	7.5
Melbourne	1,000,000	90,736	9.1
Sydney	1,127,000	110,847	9.8
AUSTRIA:			
Gratz	162,000	8,146	5.0
Vienna	1,977,000	140,759	7.1
BELGIUM:			
Antwerp	513,000	31,560	6.2
Brussels	927,000	76,251	8.2
Ghent	261,000	8,930	3.4
Liege	418,000	15,566	3.7
CANADA:			
Montreal	921,000	174,062	18.9
Ottawa	181,000	36,295	20.1
Toronto	678,000	186,215	27.5
CHINA:			
Canton	952,000	3,000*	0.3
Hong Kong	460,000	11,877	2.6
Peiping (Peking)	1,350,000	30,000*	2.2
Shanghai	1,615,000	28,000*	1.7
Tientsin	854,000	10,000*	1.2
CUBA:			
Havana	581,000	50,623	8.7
CZECHOSLOVAKIA:			
Prague	725,000	34,171	4.7
DANZIG, FREE CITY OF	301,000	16,356	5.4
DENMARK:			
Copenhagen	782,000	131,363	16.8
FINLAND:			
Helsingfors	227,000	28,193	12.4
FRANCE:			
Bordeaux	261,000	14,700	5.6
Lille	206,000	13,160	6.4
Lyons	583,000	23,790	4.1
Marseilles	665,000	22,801	3.4
Paris	2,930,000	341,863	11.7
GERMANY:			
Berlin	4,150,000	472,018	11.4
Breslau	574,000	40,501	7.1
Chemnitz	341,000	26,881	7.9
Cologne	721,000	64,858	9.0
Dresden	637,000	58,440	9.2
Dortmund	330,000	21,006	6.4
Düsseldorf	445,000	42,379	9.5
Essèn	485,000	26,851	5.5
Frankfort-on-Main	481,000	56,298	11.7
Hamburg-Altona	1,300,000	163,276	12.6
Hannover	435,000	35,288	8.1
Leipzig	700,000	66,124	9.4
Munich	715,000	69,725	9.8
Nuremburg	480,000	34,476	7.2
Stuttgart	350,000	43,878	12.5
GREAT BRITAIN AND NORTHERN IRELAND (March 31, 1929):			
Belfast	423,000	14,329	3.4
Birmingham	1,090,000	46,855	4.3
Bradford	320,000	16,992	5.3
Bristol	400,000	16,858	4.2
Edinburgh	428,000	25,556	6.0
Glasgow	1,141,000	52,757	4.6
Hull	350,000	15,800	4.5
Leeds	492,000	19,982	4.1
Liverpool	1,138,000	53,828	4.7
London	7,570,000	626,714	8.3
Manchester	1,075,000	58,157	5.4
Newcastle	467,000	17,507	3.7
Nottingham	299,000	14,023	4.7
Portsmouth	287,000	6,499	2.3
Sheffield	500,000	17,406	3.5
Stoke-on-Trent	296,000	6,075	2.1

* Partly estimated.

TELEPHONE DEVELOPMENT OF LARGE CITIES (Concluded)

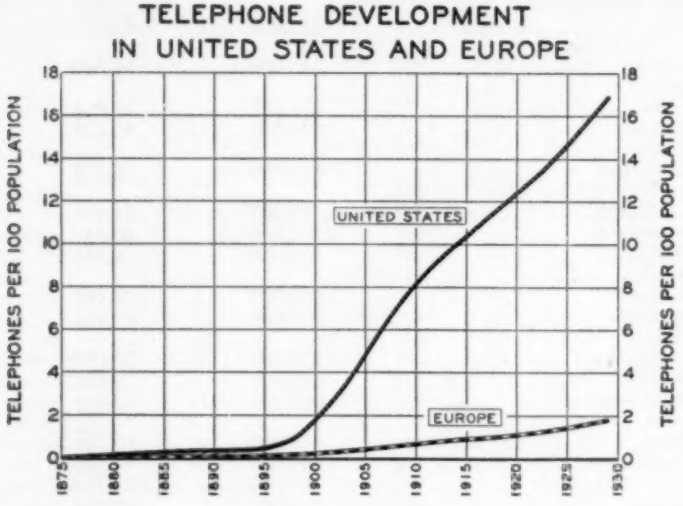
January 1, 1929

Country and City (or Exchange Area)	Estimated Population (City or Exchange Area)	Number of Telephones	Telephones per 100 Population
HUNGARY:			
Budapest	990,000	55,502	5.6
Szeged	127,000	2,420	1.9
IRISH FREE STATE (March 31, 1929):			
Dublin	394,000	14,779	3.8
ITALY:			
Genoa	542,000	18,949	3.5
Milan	831,000	56,315	6.8
Rome	771,000	32,528	4.2
Turin	502,000	22,817	4.5
JAPAN (March 31, 1929):			
Kobe	673,000	27,303	4.1
Kyoto	745,000	32,745	4.4
Nagoya	887,000	26,975	3.0
Osaka	2,370,000	93,218	3.9
Tokio	2,256,000	135,619	6.0
Yokohama	550,000	14,035	2.6
LATVIA (March 31, 1929):			
Riga	339,000	13,322	3.9
NETHERLANDS:			
Amsterdam	743,000	44,449	6.0
The Hague	457,000	35,985	7.9
Rotterdam	591,000	38,097	6.4
NEW ZEALAND (March 31, 1929):			
Auckland	210,000	18,860	9.0
NORWAY (June 30, 1928):			
Oslo	251,000	43,667	17.4
PHILIPPINE ISLANDS:			
Manila	350,000	14,747	4.2
POLAND:			
Lodz	814,000	11,018	1.4
Warsaw	1,086,000	46,623	4.3
ROUMANIA:			
Bucharest	815,000	16,355	2.0
RUSSIA (October 1, 1928):			
Leningrad	1,725,000	54,755	3.2
Moscow	2,250,000	66,542	3.0
Odessa	428,000	4,348	1.0
SPAIN:			
Barcelona	841,000	25,150	3.0
Madrid	809,000	29,362	3.6
SWEDEN:			
Gothenburg	236,000	33,089	14.0
Malmö	119,000	16,658	14.0
Stockholm	404,000	120,432	29.8
SWITZERLAND:			
Basel	144,000	18,789	13.0
Berne	111,000	15,880	14.3
Geneva	128,000	18,717	14.6
Zurich	220,000	33,965	15.4
UNITED STATES:‡			
New York	6,310,100	1,702,889	27.0
Chicago	3,250,000	942,015	29.0
Los Angeles	1,337,000	357,504	26.7
Total of the 8 cities with over 1,000,000 population	18,666,200	4,608,311	24.7
San Francisco	751,500	252,225	33.6
Cincinnati	678,100	161,019	23.7
Milwaukee	675,000	146,677	21.7
Washington	525,500	154,041	29.3
Total of the 12 cities with 500,000–1,000,000 population	7,968,300	1,698,424	21.3
Minneapolis	492,000	126,888	25.8
Portland, Ore	371,500	95,541	25.7
Omaha	232,300	62,898	27.1
Seattle	411,000	117,683	28.6
Total of the 31 cities with 200,000–500,000 population	8,999,600	1,834,164	20.4
Total of the 51 cities with over 200,000 population	35,634,100	8,140,899	22.8

*There are shown, for purposes of comparison, with cities in other countries, the total development of all cities in the United States in certain population groups and the development of certain representative cities within each of such group.

cities shown in the table, none had a development of less than 21.7 telephones per 100 population. This very high development becomes all the more significant when it is considered that, with the exception of Ottawa, Copenhagen, Oslo and Stockholm, no capital city of a foreign country had a development exceeding 15 telephones per 100 population.

Referring to the chart, "Telephones per 100 Population of Large Cities," San Francisco heads the list with a development of 33.6 telephones per 100 population. Stockholm is second with a development of 29.8 and Washington a close third with 29.3 telephones per 100 population. Of the ten cities in the chart which have a development of more than 25 telephones per 100 population, eight are located in the United States.

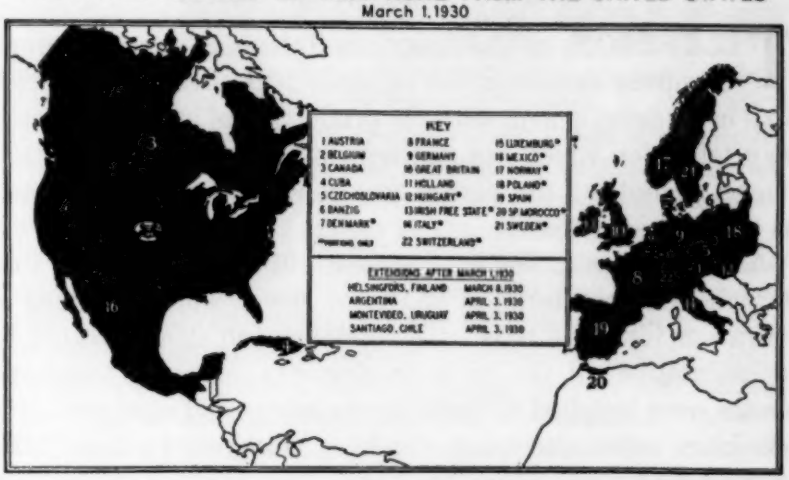


Countries Reached by Telephone from the United States

An interesting feature of the pamphlet is the chart indicating the countries which can be reached by telephone from the United States. It shows that on April 3, 1930, it was possible for a Bell System subscriber to communicate with 26 foreign countries by telephone, including the principal countries in

Europe. It is estimated that, on April 3, 1930, any Bell System subscriber was able to be connected with any one of 9,850,000 telephones outside of the United States. These telephones, together with the 4,550,000 Bell connecting tele-

COUNTRIES REACHED BY TELEPHONE FROM THE UNITED STATES
March 1, 1930



phones in the United States, comprised a total of approximately 30,150,000 telephones available to Bell System subscribers, or 86.5 percent of the estimated total of 34,840,000 telephones in the world on that date.

CLEMENT J. KOUKOL.

Notes on Recent Occurrences

TWO-WAY TELEVISION DEMONSTRATED BY BELL SYSTEM ENGINEERS

TELEVISION, as the American Telephone and Telegraph Company demonstrated on April 10th, has taken another step in its development with the production of a system of two-way television which can supplement the usual two-way telephone, permitting the parties to a conversation to see as well as to hear each other.

An experimental service between 195 Broadway and Bell Telephone Laboratories at 463 West Street, which has been in operation for some time, was disclosed and demonstrated to representatives of the press on that day. Special telephone booths were installed at these two buildings and equipped with television transmitters and receivers, designed by Bell Telephone Laboratories which have been very actively researching in television ever since their demonstration in 1927 of its scientific practicability. (*See frontis-piece.*)

This important advance in television has resulted from the efforts of the same group in Bell Telephone Laboratories as was responsible for the earlier achievements in this field. The work has continued under the direction of Dr. Herbert E. Ives, of the Laboratories' Research Department, with most important contributions by Dr. Frank Gray and by H. M. Stoller who developed synchronizing mechanisms. Amplifiers were the especial care of A. W. Horton and M. W. Baldwin.

Despite the obvious success of all their past efforts in developing television systems the engineers and scientists concerned refused to prophecy as to their next steps or the ultimate commercial importance of their experimental system.

At the demonstration on April 10th, Dr. F. B. Jewett, the President of the Laboratories, issued the following statement:

" The demonstration today by Bell Telephone Laboratories of simultaneous two-way television and speech marks a further step in the development of this interesting though as yet commercially unavailable extension of electrical communication. While the equipment has for convenience been installed only a few miles apart, and while wire circuits in ordinary underground telephone cable have been employed for the transmission channels, it might equally well have been installed hundreds or thousands of miles apart. Also it might have employed either wire or radio for the connecting channels, as was shown in the initial demonstration of television by the American Telephone & Telegraph Company in April, 1927. With suitable telephone channels of whatever sort available, the element of distance is not a controlling factor, although in this form of electrical communication as in all others greater distance ordinarily involves somewhat greater complexity and expense for channel facilities.

" At the time of the initial demonstration in 1927, of one-way television associated with two-way speech, it was stated that there was nothing inherently impossible technically in two-way television and speech. Existing knowledge at that time, particularly as regards methods of scanning, which then required intense illumination, would, however, have rendered the results rather unsatisfactory to those using the equipment. The work of Dr. Ives and his associates in Bell Telephone Laboratories during the past three years has been directed primarily toward simplification and improvement of equipment for two-way television, and particularly to improvement in the means for scanning the person whose image is to be transmitted. As the apparatus now in operation shows clearly, great progress has been made in this direction with the result that one is scarcely conscious of the scanning light or of the fact that he is doing other than looking at his distant correspondent.

" While the equipment now available for television is simpler and more efficient than that employed in the 1927 demonstrations and the results are very greatly improved, the terminal apparatus is still inherently complicated and expensive. This complication arises out of the necessity for producing, transmitting and reproducing a large number of distinct images each second if good results are to be obtained. No practical suggestions for eliminating this fundamental requirement have as yet been made and there appears to be nothing promising in our present knowledge of physical science. Correspondingly, the requirement that what is in effect a very wide band of frequencies be transmitted leaves the transmission channel problem essentially unaltered. The requirement of an extremely wide transmission band, and the further requirement that during the period of transmission the channel or channels must have a high degree of electrical

stability and freedom from extraneous interference, make the channel problem both difficult and expensive. Unlike telegraph or telephone transmission, where a limited amount of channel instability or a moderate amount of electrical interference can be present without serious impairment of service, telephotography and particularly television require practically perfect interference-free channels. For these services any marked instability in the channels or any substantial electrical interference registers at once as a serious defect in the received image. It is for this reason that while radio channels, if otherwise available, can be used for the transmission of television, they are not in the present state of the art as suitable as wire channels. Wire telephone circuits, particularly if in cable, can be maintained at a high degree of constant transmission efficiency and freedom from extraneous interference. Radio channels on the other hand are subject to the well known vicissitudes of fading, static and interference, all of which result in a degraded received image.

"Although, on account of its present complexity and high cost, no substantial commercial field is yet in sight for television requiring good images, there is still a large amount of technical work which gives promise of decided improvements over the means and methods now available. Both because of this fact and because of the collateral influence which research and development work in the television field has on our general communication problems, Bell Telephone Laboratories will continue to explore the field of television."

In response to inquiries as to the future relation of television and telephony, President Walter S. Gifford of the American Telephone and Telegraph Company, on April 10th, issued the statement that:

"The demonstration today by Bell Telephone Laboratories, of simultaneous two-way television and speech, shows some of the results obtained from our continued work in the field of television. At the time of the initial demonstration of television by the American Telephone & Telegraph Company in April, 1927, it was stated that we would continue our work on television. Partial results of this work were shown in the demonstration of out-of-door television in 1928 and of color television in June, 1929.

"The equipment which has been installed for operation over telephone wires between the Laboratories building at 463 West Street and the Telephone & Telegraph Building at 195 Broadway shows what it is possible to do technically in the present state of the art in eliminating the element of distance as affecting sight and sound in the matter of telephone conversa-

tions. This can be accomplished over any distance where suitable telephone channels, either wire or radio, are available.

"Despite the fact that the research and development work of the past three years has resulted in a great improvement and simplification of the equipment required for television, it is still necessarily complicated and expensive, requiring expert attention and large units of apparatus. These facts arise out of the inherent technical requirements for satisfactory television transmission.

"While therefore substantial progress has been made on the technical side, the future commercial possibilities of television are still uncertain. In line with our long established policy of fully exploring and developing every field which gives promise of possible improvement in and extension of electrical communication, we expect to continue our work on television."

A. T. & T. CO. OFFERS STOCK AT PAR TO 500,000 STOCKHOLDERS

IN a circular letter dated April 16, 1930, the American Telephone and Telegraph Company announced the offer to stockholders of record at the close of business on May 23, 1930, of additional shares of stock at par, $100, in the proportion of one new share for each six shares then held. The subscription privilege will expire on August 1, 1930.

The purpose of the issue is to provide funds for new construction needed by the Bell System to care for additional business resulting from the constantly greater use of telephone service.

The amount of the offer is $257,000,000 based on the amount of stock outstanding at the close of business on May 23, 1930, including stock issued before the close of business on that date in the conversion of Ten-Year Convertible 4½ percent Gold Debenture Bonds of this Company, due July 1, 1939.

The number of stockholders of the Company has grown rapidly since the first of the year and on the record date for subscription rights numbered over 500,000. The half-million mark was passed on May 10. The average number of shares

held by all stockholders on the record date was about 30, and the offer thus represents an average additional investment by stockholders of approximately $500.

Warrants evidencing the subscription rights were mailed to stockholders on June 9. The amount of the 1930 stock offer is the largest ever made by the American Telephone and Telegraph Company to its stockholders for subscription and the stockholders entitled to subscribe form the largest list of any corporation. The number exceeds those receiving rights to the 1928 stock offer by 70,000.

SHIP–TO–SHORE SERVICE EXTENDED TO CUBA, CANADA AND MEXICO; FOUR SHIPS NOW SERVED

SHIP–TO–SHORE telephone service, in addition to being available to the *Leviathan* of the United States Lines, was extended to the *Majestic* of the White Star Line on April 4th, to the *Olympic* of the White Star Line on April 18th and to the *Homeric* of the White Star Line on June 5th.

On April 12th the scope of the ship-to-shore service was enlarged to afford communication not only with all points in this country, but also with most of the cities of Cuba, Canada and Mexico.

TRANSATLANTIC TELEPHONE RATES SUBSTANTIALLY REDUCED

IN a general rate reduction, involving all transatlantic telephone conversations between North America and Europe, the American Telephone and Telegraph Company on May 11 lowered the rate on each call by $15 for the first three minutes and $5 for each additional minute. This date was scheduled to enable all transatlantic telephone calls on Mother's Day to be charged at the new low rates.

A marked increase in traffic followed the reduction in rates, applications being filed for 81 transatlantic calls on Mother's

Day, of which 62 were completed. This compares with 25 or 30 calls ordinarily put through on a normal Sunday.

On the basis of last year's transatlantic telephone messages, the reduction will mean a saving to the public using the service of approximately $450,000 a year. For the entire year of 1929, transatlantic telephone conversations averaged about fifty per business day.

Under the revised schedule, the basic rate for a telephone call between New York and London has been cut a third, from $45 to $30 for the first three minutes. Between New York and Paris, the rate has been lowered from $48.75 to $33.75; New York and Berlin, from $50.25 to $35.25; New York and Rome, from $51 to $36; New York and Madrid, from $51 to $36; New York and Stockholm, from $51.75 to $36.75. Rates to other points have been cut proportionately.

CONFERENCE OF GENERAL COUNSEL

A CONFERENCE of the General Counsel of the Bell System was held at Virginia Beach, Virginia, April 28th to May 2d. It was presided over by C. M. Bracelen, Vice President and General Counsel of the American Telephone and Telegraph Company.

1930 OPERATING CONFERENCE

THE Eighth Operating Conference of the Bell System was held at the Seaview Golf Club, Absecon, New Jersey, from May 7 to 14. This was attended by the Operating Vice Presidents and General Managers of the Bell Companies and representatives of the staff of the American Telephone and Telegraph Company. The Western Electric Company and the Bell Telephone Laboratories were also represented.

At the start of the conference President Walter S. Gifford and Vice President Bancroft Gherardi of the American Telephone and Telegraph Company both emphasized the keynote

which was taken from the statement of policy of the Bell System in the 1927 annual report and which reads as follows: "Its duty is to provide the American public with adequate, dependable and satisfactory telephone service at a reasonable cost." Mr. Gifford congratulated the management of the companies on the good work which had been done during the difficult period of the last eighteen months and expressed his confidence that the management would continue to meet its problems and to carry out its responsibilities. Mr. Gherardi showed the part that the telephone plays in the communication system of the country and the rapid strides being made in world-wide communication service and pointed out how this increased the telephone companies' responsibilities. He outlined the progress which has been made in adequate, dependable and satisfactory telephone service and discussed the trends of revenues, expenses, investment and net earnings. He pointed out that the problem of management involves a careful balance between quality of service, wages and working conditions, appearance of plant, consideration of further rate reductions, and net return on plant.

Reviews of the important phases of the operating problem were presented by W. H. Harrison, Plant Engineer, K. S. McHugh, Commercial Engineer, M. B. French, Traffic Engineer, and R. H. Burcher, Plant Operation Engineer, all of the American Telephone and Telegraph Company. Particular emphasis was placed on the construction program and on sales work.

The activities of the Western Electric Company were outlined by E. S. Bloom, President, and by C. G. Stoll, Vice President. H. P. Charlesworth, Vice President of the Bell Telephone Laboratories, Inc., gave a very interesting picture of the activities of the Laboratories. Under the title of "The New America," S. L. Andrew, Chief Statistician of the American Telephone and Telegraph Company, presented an up-to-the-minute discussion of economic trends.

One day of the conference was devoted to group discussions in which the following subjects were covered:

Area Organizations.
Revenue Possibilities Excluding General Rate Increases.
Connecting Company Matters.
By-product or Auxiliary Services.
Multiple and Zone Registration and the Timing of Local Calls.

Other subjects discussed included wages and working conditions, college quotas and the selection and training of people.

In addition to those already mentioned the conference was addressed by Vice Presidents Cooper, Page, Hall and Carter of the American Telephone and Telegraph Company.

PRES. GIFFORD IS MADE A TRUSTEE OF THE BANK FOR SAVINGS

ON March 12, 1930, President W. S. Gifford of the American Telephone and Telegraph Company was elected a trustee of the Bank for Savings in the City of New York.

E. F. CARTER AND T. G. MILLER ARE ELECTED A. T. & T. VICE PRESIDENTS

E. F. CARTER of Cleveland has been elected a Vice President of the American Telephone and Telegraph Company, and has resigned as President of The Ohio Bell Telephone Company.

Mr. Carter will take over the duties of Vice President E. K. Hall, who, in accordance with long standing plans, is retiring from the Company on August 1 to become associated with the Amos Tuck Graduate School of Business of Dartmouth College, as lecturer on industrial relations and business management. Mr. Hall has been associated with the Bell Telephone System for over thirty years.

T. G. Miller, General Manager of the Long Lines Depart-

ment, was elected a Vice President of the American Telephone and Telegraph Co. at a meeting of the board of directors on April 16. He will continue in charge of the Long Lines Department.

GENERAL COMMERCIAL CONFERENCE

A GENERAL Commercial Conference of the Bell System was held at Shawnee-on-Delaware, Pennsylvania, from May 21st to 28th, attended by the General Commercial Managers and certain staff representatives of the Associated Companies and of the American Telephone and Telegraph Company. Keith S. McHugh, Commercial Engineer of the American Telephone and Telegraph Company, opened the conference and presided throughout all of its sessions.

At the beginning of the conference, Vice President Bancroft Gherardi of the American Telephone and Telegraph Company presented a comprehensive review of the operating results and trends of the business which gave the conference members a very clear picture of the results for 1929 and the objectives for 1930.

The major part of the time of the conference was spent in the consideration of six general subjects:

Sales, Development and Customer Relations.
Business Office Operations.
Rate and Revenue Matters.
Directory Matters.
Connecting Company Matters.
Development of Commercial Supervisory Personnel.

The various subjects were introduced by American Telephone and Telegraph Company staff people and followed by papers prepared by Associated Company representatives, discussing these subjects from the standpoint of actual experience in their various territories.

Pres. Walter S. Gifford of the American Telephone and Telegraph Company gave a very interesting talk in which he mentioned the peculiar responsibility of the Commercial Department in that it must not only be technically efficient but also maintain a full and sympathetic understanding between the Telephone Company and its customers. Mr. Gifford referred also to the desirability of well coordinated and directed sales effort carried on with a proper appreciation of the customer's point of view.

Other talks of especial interest were given by Vice Presidents A. W. Page, E. F. Carter, and F. B. Jewett, of the American Telephone and Telegraph Company, by H. P. Charlesworth, Vice President of the Bell Telephone Laboratories, Inc., and by K. W. Waterson, Assistant Vice President, S. L. Andrew, Chief Statistician, L. F. Morehouse, Equipment Development Engineer, W. H. Harrison, Plant Engineer, and M. B. French, Traffic Engineer, of the American Telephone and Telegraph Company.

EMPEROR OF JAPAN CONFERS ORDER OF SACRED TREASURE ON DR. JEWETT

DR. F. B. JEWETT, Vice-President of the American Telephone and Telegraph Company and President of the Bell Telephone Laboratories, Inc., has been honored by His Majesty, the Emperor of Japan, who has conferred upon him the Order of the Third Class of the Sacred Treasure, in appreciation of his services in the development of the telegraph and telephone industry in Japan.

This is the second time that Dr. Jewett has been decorated by the Japanese Government having previously received the Order of the Rising Sun for his work in electrical communication.

Last fall, Dr. Jewett was named by President Hoover as a member of the delegation of seventeen to represent the United States at the World Engineering Congress in Tokio. In addi-

tion to being a member of the special delegation, Dr. Jewett was Vice-Chairman of the American Committee.

PRES. GIFFORD ELECTED A HARVARD OVERSEER

AT the Harvard Commencement on June 19 announcement was made that President Walter S. Gifford of the American Telephone and Telegraph Company had been elected a member of the Board of Overseers of Harvard College for a six year term.

GENERAL PLANT SUPERVISORS' CONFERENCE

THE first System conference of General Plant Supervisors was held at Shawnee-on-Delaware, Pennsylvania, from June 4th to 12th, inclusive. The conference was attended by all of the General Plant Supervisors, by certain additional representatives from the Operating Company staff and line organizations, by representatives of the Bell Telephone Laboratories, the Department of Development and Research, the Comptroller's Department and the Operation and Engineering Department of the American Telephone and Telegraph Company. Several of the nearby General Plant Managers also were present for some of the sessions.

The major part of the conference program was conducted on the committee plan basis—that is, prior to the conference a number of committees, each composed of three or four General Plant Supervisors, undertook the study of the more important phases of plant operations work with which the General Plant Supervisors are concerned and presented the conclusions of their studies at the conference. The topics handled on this basis were as follows:

1. General and Division Plant Supervisors' Staffs.
2. Administrative Reports.
3. Plant Programs.
4. Estimating Force Requirements—Design and Use of Work Schedules.
5. Forecasting and Budget Control.

6. Construction Methods and Results.
7. Installation Methods and Results.
8. Service Order Practices and Records.
9. Central Office Maintenance (Exchange and Toll).
10. Repair and Test Desk Service.
11. P.B.X. and Sub-station Maintenance.
12. Outside Plant Maintenance (Exchange and Toll).
13. Service Aspects of the Toll Maintenance Job.

Other talks and papers on matters of particular interest to the General Plant Supervisors were presented by Associate Company and American Telephone and Telegraph Company representatives, including a general review of operating results, by K. W. Waterson, Assistant Vice President, and reviews of engineering, commercial and traffic activities by H. S. Osborne, Transmission Engineer, Z. Z. Hugus, Commercial Results and Practices Engineer, and M. B. French, Traffic Engineer, all of the American Telephone and Telegraph Company. R. H. Burcher, Plant Operation Engineer, told of the important part which the plant staff organizations have played in the successful progress of plant operations work and stressed the opportunities for further effective work in the future. S. L. Andrew, Chief Statistician, gave a very interesting talk on business conditions and business statistics, with particular reference to their relationship to the telephone business. O. M. Taylor, Plant Training Engineer, spoke on the subjects of plant accidents and plant training.

Exhibit rooms were set up in which were displayed a number of the more recent developments in tools, equipment, methods and practices.

On the evening of June 4th, moving pictures were shown illustrating various construction operations, including new methods and devices for installing buried toll cable, for placing aerial cable and the use of a super-truck under unfavorable weather conditions. On the evening of June 6th, a demonstration was

given showing the transmission impairment due to noise induced in the telephone circuit by exposure to power lines and to circuit unbalances introduced by various undesirable open wire, sub-station and central office conditions. On the evenings of June 9th and 10th, practical demonstrations were given of the results of using correct and incorrect mixtures of solder in wiping joints and the feasibility of dispensing with the blow torch both in wiping and unwiping operations.

During the conference, the General Plant Supervisors were asked by Chairman Hosfeld to designate those phases of their jobs which they considered the most important ones on which to focus effort during the next year or two. In their replies, the following six items were mentioned most frequently:

1. Forecasting and Budget Control (with particular reference to maintenance expense).
2. Employee Training (vote about equally divided between vocational and supervisory training).
3. Simplification and Reduction of Clerical Work Performed by the Field Forces (including more accurate reporting).
4. Improved Outside Plant Maintenance (with emphasis on preventive maintenance).
5. Improved Installation Performance (both quality and cost).
6. Improved Repair and Test Desk Service.

Throughout the conference particular emphasis was placed upon the opportunity and importance of effecting further improvements in plant costs and service, and the opinion of all present was to the effect that the conference would greatly facilitate the achievement of that result.